EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L10	19	977/745.ccls.	US-PGPUB; USPAT	OR	ON	2006/06/06 10:18
L11	6	977/748.ccls.	US-PGPUB; USPAT	OR	ON	2006/06/06 10:18
L13	3	"2005076511"	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2006/06/06 10:28
L14	0	"200576511"	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2006/06/06 10:28
L15	1	"20050076511"	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2006/06/06 10:29
L16	2	"2004339407"	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2006/06/06 10:29
L19	8	(US-20040121018-$ or US-20040202603-$ or US-20040258603-$ or US-20050147553-$ or US-20030158351-$).did. or (US-7048999-$ or US-6858318-$). did. or (JP-2004339407-$).did.	US-PGPUB; USPAT; DERWENT	OR	ON	2006/06/06 12:54
L21	2	l19 and iodide	US-PGPUB; USPAT; DERWENT	OR	ON	2006/06/06 12:56
L22	1	l21 and benzoyl	US-PGPUB; USPAT; DERWENT	OR	ON	2006/06/06 12:56
L23	7	(nanotube nanofiber nanofibre) and (carbene)	USPAT	OR	ON	2006/06/06 14:54
L24	585	423/447.1.ccls.	US-PGPUB; USPAT	OR	ON	2006/06/06 14:55
L25	1	423/447.1.ccls. and (phenyl near3 radical) and iodide	US-PGPUB; USPAT	OR	ON	2006/06/06 14:55
L26	478	423/460.ccls.	US-PGPUB; USPAT	OR	ON	2006/06/06 14:55
L27	0	423/460.ccls. and (phenyl near3 radical) and iodide	US-PGPUB; USPAT	OR	ON	2006/06/06 14:55
S1	1	"98039250"	DERWENT; IBM_TDB	OR	ON	2006/06/02 15:18
S2	0	"WO98039250"	DERWENT; IBM_TDB	OR	ON	2006/06/02 15:19

EAST Search History

S3	0	"WO9839250"	DERWENT; IBM_TDB	OR	ON	2006/06/02 15:36
S4	23	smalley.in. and hendrickson.xp.	USPAT	OR	ON	2006/06/05 11:52
S5	8900	nano$4 and ("acyl peroxide" R-C(O)O-O(O)C-R "O-R-C(O)O-O-(O)C-R" O-R-C(O)O-O-(O)C-R' "O-R-C(O)O-O-(O)C-R'")	USPAT	OR	ON	2006/06/02 16:14
S6	847	(nanotube nanofiber nanofibre) and ("acyl peroxide" R-C(O)O-O(O)C-R "O-R-C(O)O-O-(O)C-R" O-R-C(O)O-O-(O)C-R' "O-R-C(O)O-O-(O)C-R'")	USPAT	OR	ON	2006/06/02 16:14
S7	169	(nanotube nanofiber nanofibre) same("acyl peroxide" R-C(O)O-O(O)C-R "O-R-C(O)O-O-(O)C-R" O-R-C(O)O-O-(O)C-R' "O-R-C(O)O-O-(O)C-R'")	USPAT	OR	ON	2006/06/05 11:47
S8	3	(nanotube nanofiber nanofibre) and ("acyl peroxide" "O-R-C(O)O-O-(O)C-R" "O-R-C(O)O-O-(O)C-R'")	USPAT	OR	ON	2006/06/05 12:04
S10	7	(nanotube nanofiber nanofibre) and (((acetyl n-butyryl sec-butyryl t-butyryl butyryl t-pentoyl iso-valeryl valeroyl furoyl palmitoyl decanoyl lauroyl cyclospropanoyl cyclobutanoyl cyclopentanoyl trans-t-butylcyclohexanoyl trans-4-cyclohexanecarbonyl) near3 peroxide) or ("diisopropyl peroxydicarbonate" "butylperoxyisopropyl carbonate" "cyclohexyl peroxycarbonate") or ("acyl peroxide" with terminal with carboxylic with acid))	USPAT	OR	ON	2006/06/05 16:21
S11	169	(nanotube nanofiber nanofibre) same ("acyl peroxide" R-C(O)O-O(O)C-R "O-R-C(O)O-O-(O)C-R" O-R-C(O)O-O-(O)C-R' "O-R-C(O)O-O-(O)C-R'")	USPAT	OR	ON	2006/06/05 11:48
S12	29	smalley.in. and (chemistry same nanotube)	USPAT	OR	ON	2006/06/05 11:52
S13	0	(nanotube nanofiber nanofibre) and (aroyl near3 peroxide)	USPAT	OR	ON	2006/06/05 12:04

EAST Search History

S14	3	(nanotube nanofiber nanofibre) and ((acyl near3 peroxide) "O-R-C(O)O-O-(O)C-R" "O-R-C(O)O-O-(O)C-R'")	USPAT	OR	ON	2006/06/05 16:21
S15	19	(nanotube nanofiber nanofibre) and (((benzoyl cinnamoyl "bis(p-methoxybenzoyl)" "p-monomethoxybenzoyl" "benzoyl phenylacetyl" "bis(o-phenoxybenzoyl)" "acetyl benzoyl" "p-nitrobenzoyl" "p-chlorobenzoyl" "bis(2, 4-dichlorobenzoyl)" "p-methylbenzoyl" "p-methoxybenzoyl" "exo-norbornene-5-carbonyl" "endo-norbornene-5-carbonyl") near3 peroxide) or ("t-butyl peroxybenzoate" "p-bromobenzoyl"))	USPAT	OR	ON	2006/06/05 16:22
S16	2	(nanotube nanofiber nanofibre) and (acyl with dicarboxylic)	USPAT	OR	ON	2006/06/05 16:22
S18	0	(nanotube nanofiber nanofibre) and "HO(O)C(CHsub.2.)sub.n. C(O)OO(O)C(CHsub.2.)sub.m. C(O)OH"	USPAT	OR	ON	2006/06/05 16:22
S19	53	(nanotube nanofiber nanofibre) and (succinic glutaric)	USPAT	OR	ON	2006/06/05 12:19
S20	1	(nanotube nanofiber nanofibre) and ((succinic glutaric) with peroxide)	USPAT	OR	ON	2006/06/05 16:23
S21	5	(nanotube nanofiber nanofibre) and (terminal with dicarboxylic)	USPAT	OR	ON	2006/06/05 16:23
S24	71	(nanotube nanofiber nanofibre) and (dicarboxylic)	USPAT	OR	ON	2006/06/05 15:26
S25	13	(nanotube nanofiber nanofibre) and (phenyl near3 radical)	USPAT	OR	ON	2006/06/06 13:08
S26	0	S25 and iodide	USPAT	OR	ON	2006/06/05 16:23

EAST Search History

S27	17	(nanotube nanofiber nanofibre) and (((acetyl n-butyryl sec-butyryl t-butyryl butyryl t-pentoyl iso-valeryl valeroyl furoyl palmitoyl decanoyl lauroyl cyclospropanoyl cyclobutanoyl cyclopentanoyl trans-t-butylcyclohexanoyl trans-4-cyclohexanecarbonyl) near3 peroxide) or ("diisopropyl peroxydicarbonate" "butylperoxyisopropyl carbonate" "cyclohexyl peroxycarbonate") or ("acyl peroxide" with terminal with carboxylic with acid))	US-PGPUB	OR	ON	2006/06/05 17:46
S28	10	(nanotube nanofiber nanofibre) and ((acyl near3 peroxide) "O-R-C(O)O-O-(O)C-R" "O-R-C(O)O-O-(O)C-R'")	US-PGPUB	OR	ON	2006/06/05 17:46
S29	68	(nanotube nanofiber nanofibre) and (((benzoyl cinnamoyl "bis(p-methoxybenzoyl)" "p-monomethoxybenzoyl" "benzoyl phenylacetyl" "bis(o-phenoxybenzoyl)" "acetyl benzoyl" "p-nitrobenzoyl" "p-chlorobenzoyl" "bis(2, 4-dichlorobenzoyl)" "p-methylbenzoyl" "p-methoxybenzoyl" "exo-norbornene-5-carbonyl" "endo-norbornene-5-carbonyl") near3 peroxide) or ("t-butyl peroxybenzoate" "p-bromobenzoyl"))	US-PGPUB	OR	ON	2006/06/05 17:47
S30	4	(nanotube nanofiber nanofibre) and (acyl with dicarboxylic)	US-PGPUB	OR	ON	2006/06/05 17:47
S31	0	(nanotube nanofiber nanofibre) and "HO(O)C(CHsub.2.)sub.n. C(O)OO(O)C(CHsub.2.)sub.m. C(O)OH"	US-PGPUB	OR	ON	2006/06/05 17:45
S32	3	(nanotube nanofiber nanofibre) and ((succinic glutaric) with peroxide)	US-PGPUB	OR	ON	2006/06/05 17:47
S33	10	(nanotube nanofiber nanofibre) and (terminal with dicarboxylic)	US-PGPUB	OR	ON	2006/06/05 17:48
S34	36	(nanotube nanofiber nanofibre) and (phenyl near3 radical)	US-PGPUB	OR	ON	2006/06/05 17:48
S35	3	S34 and iodide	US-PGPUB	OR	ON	2006/06/05 17:43

EAST Search History

S40	0	(nanotube nanofiber nanofibre) and (((acetyl n-butyryl sec-butyryl t-butyryl butyryl t-pentoyl iso-valeryl valeroyl furoyl palmitoyl decanoyl lauroyl cyclospropanoyl cyclobutanoyl cyclopentanoyl trans-t-butylcyclohexanoyl trans-4-cyclohexanecarbonyl) near3 peroxide) or ("diisopropyl peroxydicarbonate" "butylperoxyisopropyl carbonate" "cyclohexyl peroxycarbonate") or ("acyl peroxide" with terminal with carboxylic with acid))	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2006/06/05 17:46
S41	2	(nanotube nanofiber nanofibre) and ((acyl near3 peroxide) "O-R-C(O)O-O-(O)C-R" "O-R-C(O)O-O-(O)C-R'")	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2006/06/05 17:48
S42	0	(nanotube nanofiber nanofibre) and (((benzoyl cinnamoyl "bis(p-methoxybenzoyl)" "p-monomethoxybenzoyl" "benzoyl phenylacetyl" "bis(o-phenoxybenzoyl)" "acetyl benzoyl" "p-nitrobenzoyl" "p-chlorobenzoyl" "bis(2, 4-dichlorobenzoyl)" "p-methylbenzoyl" "p-methoxybenzoyl" "exo-norbornene-5-carbonyl" "endo-norbornene-5-carbonyl") near3 peroxide) or ("t-butyl peroxybenzoate" "p-bromobenzoyl"))	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2006/06/05 17:47
S43	0	(nanotube nanofiber nanofibre) and (acyl with dicarboxylic)	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2006/06/05 17:47
S44	0	(nanotube nanofiber nanofibre) and ((succinic glutaric) with peroxide)	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2006/06/05 17:47
S45	0	(nanotube nanofiber nanofibre) and (terminal with dicarboxylic)	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2006/06/05 17:48
S46	1	(nanotube nanofiber nanofibre) and (phenyl near3 radical)	EPO; JPO; DERWENT; IBM_TDB	OR	ON	2006/06/05 17:49
S47	112	S27 S28 S29 S30 S31 S32 S33 S34	US-PGPUB	OR	ON	2006/06/05 17:50

Access DB# 186512

SEARCH REQUEST FORM

Scientific and Technical Information Center

Requester's Full Name: Rebecca Stadler Examiner #: 81028 Date: April 21, 2006
Art Unit: 1754 Phone Number 30 2-5956 Serial Number: 10/714,014
Mail Box and Bldg/Room Location: Rmsn 9D54 Results Format Preferred (circle): (PAPER) DISK E-MAIL

If more than one search is submitted, please prioritize searches in order of need.

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Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: Method for functionalizing carbon nanotubes utilizing peroxides

Inventors (please provide full names): Valery N. Khabashesku

See attached bib sheet for the rest.

Earliest Priority Filing Date: 11/15/2002

**For Sequence Searches Only* Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.*

See attached claims [redacted] 1-42

SCIENTIFIC REFERENCE BR
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STAFF USE ONLY	Type of Search		Vendors and cost where applicable	
Searcher: EL	NA Sequence (#)		STN	
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Searcher Location:	Structure (#)		Questel/Orbit	
Date Searcher Picked Up:	Bibliographic		Dr.Link	
Date Completed: 5-4-06	Litigation		Lexis/Nexis	
Searcher Prep & Review Time:	Fulltext		Sequence Systems	
Clerical Prep Time:	Patent Family		WWW/Internet	
Online Time:	Other		Other (specify)	

PTO-1590 (8-01)

What is claimed is:

1. A method for functionalizing a carbon nanotube, comprising:

   (a) decomposing an acyl peroxide to form carbon-centered free radicals; and R-I optional

   (b) reacting the carbon-centered free radicals with the carbon nanotube to form a functionalized carbon nanotube.

2. The method of claim 1, wherein the functionalized carbon nanotube is a sidewall-functionalized carbon nanotube.

3. The method of claim 1, wherein (a) the acyl peroxide comprises a first organic group R; (b) the carbon-centered free radicals comprise first carbon-centered free radicals ·R; and (c) the functionalized carbon nanotube comprises the first organic group R bonded to a sidewall of the carbon nanotube.

4. The method of claim 3, wherein the acyl peroxide has a form R-C(O)O-O-(O)C-R.

5. The method of claim 3, wherein the first organic group R comprises a number of carbon atoms in the range of 1 to about 30.

6. The method of claim 3, wherein (a) the acyl peroxide comprises a second organic group R'; (b) the acyl peroxide has a form R-C(O)O-O-(O)C-R'; (c) the carbon-centered free radicals comprise second carbon-centered free radicals ·R', and (d) the functionalized carbon nanotube comprises the second organic group R' bonded to the sidewall of the carbon nanotube.

7. The method of claim 6, wherein the first organic group R comprises a number of carbon atoms in the range of 1 to about 30 and wherein the second organic group R' comprises a number of carbon atoms in the range of 1 to about 30.

8. The method of claim 1, wherein the carbon nanotube is selected from the group consisting of a single-wall carbon nanotube, a multi-wall carbon nanotube and a combination thereof.

9. The method of claim 1, wherein the carbon nanotube is a sidewall-fluorinated carbon nanotube.

10. The method of claim 1, wherein the acyl peroxide is selected from the group consisting of acetyl peroxide, n-butyryl peroxide, sec-butyryl peroxide, t-butyryl peroxide, t-pentoyl peroxide, iso-valeryl peroxide, valeroyl peroxide, furoyl peroxide, palmitoyl peroxide, decanoyl peroxide, lauroyl peroxide, cyclopropanoyl peroxide, cyclobutanoyl peroxide, cyclopentanoyl peroxide, trans-t-butylcyclohexanoyl peroxide, trans-4-cyclohexanecarbonyl peroxide, diisopropyl peroxydicarbonate, butylperoxyisopropyl carbonate, cyclohexyl peroxydicarbonate, an acyl peroxide having terminal carboxylic acid groups, and combinations thereof.

11. The method of claim 1, wherein the acyl peroxide is an aroyl peroxide.

12. The method of claim 11, wherein the aroyl peroxide is selected from the group consisting of benzoyl peroxide, cinnamoyl peroxide, bis(*p*-methoxybenzoyl) peroxide, *p*-monomethoxybenzoyl peroxide, benzoyl phenylacetyl peroxide, bis(o-phenoxybenzoyl) peroxide, acetyl benzoyl peroxide, *t*-butyl peroxybenzoate, *p*-nitrobenzoyl peroxide, *p*-bromobenzoyl, *p*-chlorobenzoyl peroxide, bis(2,4-dichlorobenzoyl) peroxide, *p*-methylbenzoyl peroxide, *p*-methoxybenzoyl peroxide, *exo*-norbornene-5-carbonyl peroxide, *endo*-norbornene-5-carbonyl peroxide and combinations thereof.

13. The method of claim 11, wherein the aroyl peroxide comprises benzoyl peroxide.

14. The method of claim 1, wherein (a) the acyl peroxide is an acyl dicarboxylic acid peroxide, having a chemical formula of $HO(O)C(CH_2)_nC(O)OO(O)C(CH_2)_mC(O)OH$; (b) n is a number in the range of 1 to about 20; and (c) m is a number in the range of 1 to about 20.

15. The method of claim 14, wherein the acyl dicarboxylic acid peroxide is selected from the group consisting of succinic acid peroxide, glutaric acid peroxide, and combinations thereof.

16. The method of claim 1, wherein the acyl peroxide has terminal dicarboxylic acid groups, and further comprising reacting a chlorinating agent with the terminal carboxylic acid groups to bond terminal acyl chloride groups on a sidewall of the carbon nanotube.

17. The method of claim 16, wherein the chlorinating agent is selected from the group consisting of thionyl chloride, phosphorous trichloride, phosphorous pentachloride, oxalyl chloride and combinations thereof.

18. The method of claim 16, wherein the chlorinating agent is thionyl chloride.

19. The method of claim 18 further comprising reacting an amine with the terminal acyl chloride groups to form an amide.

20. The method of claim 19, wherein the amine is a diamine and the amide has a terminal amine.

21. The method of claim 19, wherein the amine is selected from the group consisting of an alkyl amine, an aryl amine and combinations thereof.

22. The method of claim 20, wherein the diamine is selected from the group consisting of an alkyl diamine, an aryl diamine and combinations thereof.

23. The method of claim 22, wherein the alkyl diamine comprises a cyclohexyl group.

24. The method of claim 20, wherein the diamine is selected from the group consisting of ethylene diamine, 4,4'methylenebis(cyclohexylamine), propylene diamine, butylene diamine, hexamethylene diamine and combinations thereof.

25. The method of claim 1, wherein the decomposing occurs in the presence of the carbon nanotubes in a solid-state reaction.

26. The method of claim 1, wherein the decomposing occurs in the presence of the carbon nanotubes, wherein the carbon nanotubes and the acyl peroxide are dispersed in a solvent.

27. A method for functionalizing a carbon nanotube, comprising:

(a) providing phenyl radicals in the presence of an organic iodide, wherein the phenyl radicals react with the organic iodide to form carbon-centered free radicals; and

(b) reacting the carbon-centered free radicals with a carbon nanotube to form a functionalized carbon nanotube.

28. The method of claim 27, wherein the functionalized carbon nanotube is a sidewall-functionalized carbon nanotube.

29. The method of claim 27, wherein (a) the organic iodide comprises an organic group R; (b) the carbon-centered free radicals comprise ·R carbon-centered free radicals; and (c) the functionalized carbon nanotube comprises the organic group R bonded to a sidewall of the carbon nanotube.

30. The method of claim 29, wherein (a) the organic iodide has a form RI; and (b) a carbon atom in the organic group R is bonded to iodine.

31. The method of claim 27, wherein the carbon nanotube is selected from the group consisting of a single-wall carbon nanotube, a multi-wall carbon nanotube and a combination thereof.

32. The method of claim 27, wherein the carbon nanotube is a sidewall-fluorinated carbon nanotube.

33. The method of claim 27, wherein the phenyl radicals are provided by decomposition of benzoyl peroxide.

34. The method of 27, wherein the organic iodide comprises an organic group selected from the group consisting of an alkyl group, an aryl group, a cyclic group, and combinations thereof.

35. The method of claim 27, wherein the organic iodide is an alkyl iodide.

36. The method of claim 35, wherein the alkyl iodide comprises an alkyl group selected from the group consisting of a hydrocarbon alkyl group, an alkyl amide, an alkyl amine, alkyl halide, an alkyl cyanide, a nitro alkyl, an alkyl ether, an alkyl ester, an

alkyl ether, an alkyl ketone, an alkyl carboxylic acid, an alkyl carboxylate and combinations thereof.

37. The method of claim 35, wherein the alkyl iodide comprises an alkyl group comprising heteroatoms selected from the group consisting of nitrogen, oxygen, halogens, and combinations thereof.

38. The method of claim 36, wherein the alkyl group has a number of carbon atoms in the range of 1 and about 30.

39. The method of claim 37, wherein the alkyl group has a number of carbon atoms in the range of 1 and about 30.

40. The method of claim 29, wherein the organic group is a polymeric group.

41. The method of claim 40, wherein the polymeric group comprises poly(ethylene glycol).

42. The method of claim 40, wherein the polymeric group is selected from the group consisting of a polyolefin, a polyester, a polyurethane, and combinations thereof.

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Bib Data Sheet

CONFIRMATION NO. 1957

SERIAL NUMBER	FILING DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
10/714,014	11/14/2003 RULE	423	1754	11321-P056US

APPLICANTS

Valery N. Khabashesku, Houston, TX;

Haiqing Peng, Houston, TX;
John L. Margrave, Bellaire, TX, Deceased;Mary Lou Margrave, Bellaire, TX, Legal Representative;
Wilbur Edward Billups, Houston, TX;
Yunming Ying, Houston, TX;

** CONTINUING DATA **********

This appln claims benefit of 60/426,784 11/15/2002
and claims benefit of 60/483,817 06/30/2003

** FOREIGN APPLICATIONS **********

Foreign Priority claimed	STATE OR	SHEETS	TOTAL	INDEPENDENT
☐ yes ☐ no	COUNTRY	DRAWING	CLAIMS	CLAIMS
35 USC 119 (a-d) conditions met ☐ yes ☐ no ☐ Met after Allowance	TX	12	78	4
Verified and Acknowledged Examiner's Signature Initials				

ADDRESS
Ross Spencer Garsson
1201 Main Street
P.O. Box 50784
Dallas , TX
77250-0784

TITLE
Method for functionalizing carbon nanotubes utilizing peroxides

FILING FEE	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time)

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L1             STR

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L3          1775 SEA SSS FUL L1
                 SAV L3 STA014/A
L4        460054 SEA (C(L)H(L)I)/ELS
L5          7551 SEA L4 (L) 3/ELC.SUB
L6        454565 SEA L4 NOT PMS/CI
L7          7373 SEA L5 AND L6
                 E CARBON/CN
L8             1 SEA CARBON/CN
                 E GRAPHITE/CN
L9             1 SEA GRAPHITE/CN

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                 RODDING# OR SHELL?))
L12        14303 SEA L3
L13         1475 SEA (ACYL OR DIACYL)(2A)PEROXIDE#
L14        56683 SEA L7
L15         9552 SEA (ORG# OR ORGANIC? OR ALKYL? OR ARYL?)(2A)(IODIDE# OR
                 POLYIODIDE#)
L16           19 SEA L11 AND (L12 OR L13)
L17        23483 SEA (CARBON# OR CARBONACEOUS? OR CARBONIFEROUS? OR
                 C)(3A)(NANOTUB? OR NANOCYLIND? OR NANOROD? OR NANOSHELL?
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L18        18256 SEA (L8 OR L9 OR GRAPHIT?) AND (NANOTUB? OR NANOCYLIND?
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                 OR TUBUL? OR TUBIFORM? OR CYLIND? OR ROD OR RODS OR
                 RODDED OR RODDING# OR SHELL?))
L19           19 SEA (L17 OR L18) AND (L12 OR L13)
L20        32321 SEA (CARBON# OR CARBONACEOUS? OR CARBONIFEROUS? OR
                 C)(3A)NANO?
L21        29649 SEA (L8 OR L9 OR GRAPHIT?) AND NANO?
L22           26 SEA (L20 OR L21) AND (L12 OR L13)
L23            4 SEA L22 AND (L14 OR L15 OR RI OR R(W)I)
L24           15 SEA (L16 OR L19) NOT L23
L25            7 SEA L22 NOT (L23 OR L24)

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L1                STR

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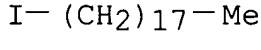
L23 ANSWER 1 OF 4 HCA COPYRIGHT 2006 ACS on STN
142:394456 Functionalization and Extraction of Large Fullerenes and Carbon-Coated Metal Formed during the Synthesis of Single Wall **Carbon Nanotubes** by Laser Oven, Direct Current Arc, and High-Pressure Carbon Monoxide Production Methods. Sadana, Anil K.; Liang, Feng; Brinson, Bruce; Arepalli, Sivaram; Farhat, Samir; Hauge, Robert H.; Smalley, Richard E.; Billups, W. E. (Department of Chemistry and the Center for Nanoscale Science and Technology, Rice University, Houston, TX, 77005, USA). Journal of Physical Chemistry B, 109(10), 4416-4418 (English) 2005. CODEN: JPCBFK. ISSN: 1520-6106. Publisher: American Chemical Society.

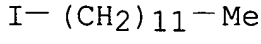
AB Large fullerenes and **carbon**-coated metal **nanoparticles**, formed in the synthesis of **carbon nanotubes**, were functionalized by alkylation with C12-alkyl and C18-alkyl radicals, and isolated by extn. into chloroform. The alkyl radicals were formed in-situ from dibenzoyl peroxide reaction with 1-dodecyl iodide and 1-octadecyl iodide, resp. The sol., functionalized fullerenes were isolated from raw single-wall **carbon nanotube** (SWNT) material prepd. by laser oven, d.c. arc, and high-pressure carbon monoxide prodn. methods. Analyses of the extd. large fullerenes were carried out by thermogravimetric anal., UV-vis-near-IR, laser desorption ionization mass spectrometry, and high-resoln. transmission electron microscopy. Laser desorption ionization mass spectrometry showed a range of peaks at 600-4500 amu, with peaks evenly sepd. at a spacing of 24 amu (C2-elimination).

IT **629-93-6**, Octadecyl iodide **4292-19-7**, Dodecyl iodide
(Ph radical reaction with; alkylation and solvent extn. of large fullerenes and carbon-coated metals from manuf. of single-walled **carbon nanotubes**)

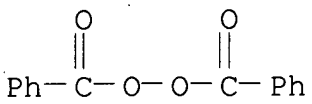
RN 629-93-6 HCA
CN Octadecane, 1-iodo- (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)



RN 4292-19-7 HCA
CN Dodecane, 1-iodo- (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)



IT **94-36-0**, Dibenzoyl peroxide, reactions
(in-situ radical source; alkylation and solvent extn. of large fullerenes and carbon-coated metals from manuf. of single-walled **carbon nanotubes**)
RN 94-36-0 HCA
CN Peroxide, dibenzoyl (9CI) (CA INDEX NAME)



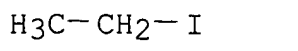
IT **7440-44-0P**, **Carbon**, preparation
(**nanotubes**, single-walled; alkylation and solvent extn. of large fullerenes and carbon-coated metals from manuf. of single-walled **carbon nanotubes**)
RN 7440-44-0 HCA
CN Carbon (7CI, 8CI, 9CI) (CA INDEX NAME)

C

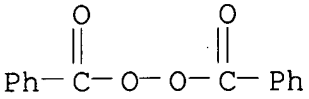
CC 49-1 (Industrial Inorganic Chemicals)
ST fullerene functionalization **carbon nanotube** manuf; alkylation solvent extn fullerene byproduct **carbon nanotube** manuf; carbon metal coating alkylation **carbon nanotube** manuf
IT Fullerenes
(C12- and C18-alkylated; alkylation and solvent extn. of large fullerenes and carbon-coated metals from manuf. of single-walled **carbon nanotubes**)
IT **Nanotubes**
(**carbon**, single-walled; alkylation and solvent extn. of large fullerenes and carbon-coated metals from manuf. of single-walled **carbon nanotubes**)
IT Mass spectrometers
(photoionization, laser-induced, desorption, time-of-flight, of alkylated fullerenes; alkylation and solvent extn. of large fullerenes and carbon-coated metals from manuf. of single-walled **carbon nanotubes**)
IT Alkylation
(radical; alkylation and solvent extn. of large fullerenes and carbon-coated metals from manuf. of single-walled **carbon nanotubes**)
IT **629-93-6**, Octadecyl iodide **4292-19-7**, Dodecyl iodide
(Ph radical reaction with; alkylation and solvent extn. of large fullerenes and carbon-coated metals from manuf. of single-walled

carbon nanotubes)
IT 34448-85-6, Octadecyl 34977-49-6, Dodecyl
(alkylating agent; alkylation and solvent extn. of large fullerenes and carbon-coated metals from manuf. of single-walled **carbon nanotubes**)
IT 67-66-3, Chloroform, uses
(extn. solvent; alkylation and solvent extn. of large fullerenes and carbon-coated metals from manuf. of single-walled **carbon nanotubes**)
IT **94-36-0**, Dibenzoyl peroxide, reactions
(in-situ radical source; alkylation and solvent extn. of large fullerenes and carbon-coated metals from manuf. of single-walled **carbon nanotubes**)
IT **7440-44-0P**, **Carbon**, preparation
(**nanotubes**, single-walled; alkylation and solvent extn. of large fullerenes and carbon-coated metals from manuf. of single-walled **carbon nanotubes**)

L23 ANSWER 2 OF 4 HCA COPYRIGHT 2006 ACS on STN
141:356031 Functionalized **nanotubes**. Fischer, Alan; Hoch, Robert; Moy, David; Lu, Ming; Martin, Mark; Niu, Chun Ming; Ogata, Naoya; Tennent, Howard; Dong, Liwen; Sun, Ji; Helms, Larry; Jameison, Fabian; Liang, Pam; Simpson, David (Hyperion Catalysis International, Inc., USA). U.S. Pat. Appl. Publ. US 2004202603 A1 20041014, 50 pp., Cont.-in-part of U.S. Ser. No. -594,673. (English). CODEN: USXXCO. APPLICATION: US 2004-837125 20040430. PRIORITY: US 1994-352400 19941208; US 1996-611368 19960306; US 1996-PV37238 19960925; US 1997-812856 19970306; US 2000-2000/594673 20000616.
AB The invention describes **graphitic nanotubes**, which includes tubular fullerenes (commonly called "buckytubes") and fibrils, which are functionalized by chem. substitution or by adsorption of functional moieties. More specifically the invention relates to **graphitic nanotubes** which are uniformly or non-uniformly substituted with chem. moieties or upon which certain cyclic compds. are adsorbed and to complex structures comprised of such functionalized **nanotubes** linked to one another. The invention also relates to methods for introducing functional groups onto the surface of such **nanotubes**. The invention further relates to uses for functionalized **nanotubes**.
IT **75-03-6**, Ethyl iodide
(for prepn. of triethyl(2-hydroxyethyl)ammonium iodide)
RN 75-03-6 HCA
CN Ethane, iodo- (8CI, 9CI) (CA INDEX NAME)



IT **94-36-0**, Benzoyl peroxide, reactions
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
RN 94-36-0 HCA
CN Peroxide, dibenzoyl (9CI) (CA INDEX NAME)



IC ICM D01F009-12
ICS C07C063-333
INCL 423447200; 562492000; 564426000
CC 66-4 (Surface Chemistry and Colloids)
Section cross-reference(s): 7
ST **carbon nanotube** fibril surface functionalization; enzyme immobilization surface functionalized carbon fibril
IT Dendritic polymers
(**carbon nanotube** and fibril surface bonded; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT **Nanotubes**
(**carbon**, surface functionalized; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT Fibril
(carbon; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT Immobilization, molecular or cellular
(enzyme; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT Electrodes
(flow-through; surface functionalization of **carbon nanotubes** and fibrils for substance immobilization)
IT Enzymes, processes
(immobilized; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT Solid phase synthesis
(peptide; surface functionalization of **carbon nanotubes** and fibrils for substance immobilization)
IT Albumins, processes
(serum; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT Affinity chromatographic stationary phases
Functional groups

Surface reaction
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT Avidins
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT Antibodies and Immunoglobulins
(surface functionalization of **carbon nanotubes** and fibrils for protein immobilization)

IT Polyoxyalkylenes, processes
(surface reaction product with **carbon nanotubes** and fibrils; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT Lactoglobulins
(.beta.-; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 7440-57-5, Gold, reactions
(attachment of thiol modified **carbon nanotubes** to gold surfaces)

IT **75-03-6**, Ethyl iodide 100-37-8, N,N-Diethylethanolamine
(for prepn. of triethyl(2-hydroxyethyl)ammonium iodide)

IT 5957-17-5P, Triethyl(2-hydroxyethyl)ammonium iodide
(prepn. and reaction with **carbon nanotube** and fibrils surfaces)

IT 653-37-2, Pentafluorobenzaldehyde
(reaction with ethylenediamine surface bonded to surface of **carbon nanotubes** and fibrils)

IT 9013-20-1, Streptavidin
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 9001-62-1, Lipase
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 9002-07-7, Trypsin
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 9001-78-9, Alkaline phosphatase 9035-51-2, Cytochrome P450, processes
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 6066-82-6D, N-Hydroxysuccinimide, surface reaction product with **carbon nanotubes** and fibrils
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 25322-68-3DP, surface reaction product with **carbon nanotubes** and fibrils
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT **94-36-0**, Benzoyl peroxide, reactions 9003-99-0, Peroxidase
(surface functionalization of **carbon nanotubes**
and fibrils for enzyme immobilization)

IT 107-15-3DP, 1,2-Ethanediamine, surface reaction product with **carbon nanotubes** and fibrils 109-02-4DP, surface reaction product with **carbon nanotubes** and fibrils 7775-09-9DP, Sodium chlorate, surface reaction product with **carbon nanotubes** and fibrils 23586-53-0DP, Thallium(III) trifluoroacetate, surface reaction product with **carbon nanotubes** and fibrils 30189-36-7DP, Bis(tert-butoxycarbonyl)lysine-N-hydroxysuccinimide, surface reaction product with **carbon nanotubes** and fibrils 65915-94-8P, N-tert-Butoxycarbonyl-1,6-diaminohexane hydrochloride 79849-03-9DP, Nitrilotriacetic acid hydrochloride, surface reaction product with **carbon nanotubes** and fibrils
(surface functionalization of **carbon nanotubes**
and fibrils for enzyme immobilization)

IT 56-87-1DP, L-Lysine, carbon fibril bonded, preparation 58-85-5DP, Biotin, surface reaction product with carbon fibrils 60-24-2DP, Monothioethylene glycol, surface reaction product with **carbon nanotubes** and fibrils 75-89-8DP, 2,2,2-Trifluoroethanol, surface reaction product with **carbon nanotubes** and fibrils 79-06-1DP, 2-Propenamide, surface reaction product with **carbon nanotubes** and fibrils 79-10-7DP, 2-Propenoic acid, surface reaction product with **carbon nanotubes** and fibrils 107-02-8DP, Propenal, surface reaction product with **carbon nanotubes** and fibrils 107-11-9DP, 3-Amino-1-propene, surface reaction product with **carbon nanotubes** and fibrils 107-13-1DP, 2-Propenenitrile, surface reaction product with **carbon nanotubes** and fibrils 107-18-6DP, 2-Propen-1-ol, surface reaction product with **carbon nanotubes** and fibrils 108-31-6DP, 2,5-Furandione, surface reaction product with **carbon nanotubes** and fibrils 109-72-8DP, Butyllithium, surface reaction product with **carbon nanotubes** and fibrils 110-16-7DP, 2-Butenedioic acid (Z)-, surface reaction product with **carbon nanotubes** and fibrils 111-86-4DP, 1-Octanamine, surface reaction product with **carbon nanotubes** and fibrils 124-30-1DP, 1-Octadecanamine, surface reaction product with **carbon nanotubes** and fibrils 151-50-8DP, Potassium cyanide, surface reaction product with **carbon nanotubes** and fibrils 530-62-1DP, N,N'-Carbonyl diimidazole, surface reaction product with **carbon nanotubes** and fibrils 593-56-6DP, Methoxyamine hydrochloride, surface reaction product with **carbon nanotubes** and fibrils 814-68-6DP,

Propenoyl chloride, surface reaction product with **carbon nanotubes** and fibrils 994-30-9DP, Chlorotriethylsilane, surface reaction product with **carbon nanotubes** and fibrils 1310-73-2DP, Sodium hydroxide, surface reaction product with **carbon nanotubes** and fibrils 1333-74-0DP, Hydrogen, surface reaction product with **carbon nanotubes** and fibrils 1336-21-6DP, Ammonium hydroxide, surface reaction product with **carbon nanotubes** and fibrils 1892-57-5DP, 1-Ethyl-3-(3-dimethylaminopropyl)carbodiimide, surface reaction product with **carbon nanotubes** and fibrils 2016-57-1DP, 1-Aminodecane, surface reaction product with **carbon nanotubes** and fibrils 2074-87-5DP, Cyanogen, surface reaction product with **carbon nanotubes** and fibrils 4048-33-3DP, 6-Aminohexan-1-ol, surface reaction product with **carbon nanotubes** and fibrils 4781-83-3DP, 2-Iminothiolane hydrochloride, surface reaction product with **carbon nanotubes** and fibrils 5591-94-6DP, surface reaction product with **carbon nanotubes** and fibrils 5957-17-5DP, Triethyl(2-hydroxyethyl)ammonium iodide, surface reaction product with **carbon nanotubes** and fibrils 7664-41-7DP, Ammonia, surface reaction product with **carbon nanotubes** and fibrils 7664-93-9DP, Sulfuric acid, surface reaction product with **carbon nanotubes** and fibrils 7697-37-2DP, Nitric acid, surface reaction product with **carbon nanotubes** and fibrils 7704-34-9DP, Sulfur, surface reaction product with **carbon nanotubes** and fibrils 7732-18-5DP, Water, surface reaction product with **carbon nanotubes** and fibrils 7782-44-7DP, Oxygen, surface reaction product with **carbon nanotubes** and fibrils 13214-66-9DP, 4-Phenylbutylamine, surface reaction product with **carbon nanotubes** and fibrils 19008-71-0DP, 8-Aminooctan-1-ol, surface reaction product with **carbon nanotubes** and fibrils 23160-46-5DP, 10-Aminodecan-1-ol, surface reaction product with **carbon nanotubes** and fibrils 103708-09-4DP, Sulfosuccinimidyl-4-(N-maleimidomethyl)cyclohexanecarboxylate, surface reaction product with **carbon nanotubes** and fibrils 142755-63-3DP, 18-Aminooctadecan-1-ol, surface reaction product with **carbon nanotubes** and fibrils
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 53-84-9, NAD
(surface functionalization of **carbon nanotubes** and fibrils for prepn. of affinity matrixes)

IT 9001-60-9P, Lactate dehydrogenase
(surface functionalization of **carbon nanotubes**

and fibrils for prepn. of affinity matrixes)

L23 ANSWER 3 OF 4 HCA COPYRIGHT 2006 ACS on STN
138:407416 Functionalization of **Carbon Nanotubes** by Free Radicals. Ying, Yunming; Saini, Rajesh K.; Liang, Feng; Sadana, Anil K.; Billups, W. E. (Department of Chemistry and Center for Nanoscale Science and Technology, Rice University, Houston, TX, 77005-1892, USA). Organic Letters, 5(9), 1471-1473 (English) 2003. CODEN: ORLEF7. ISSN: 1523-7060. Publisher: American Chemical Society.

AB Free radicals generated by decompn. of benzoyl peroxide in the presence of **alkyl iodides** have been used to derivatize small-diam. single-wall **carbon nanotubes** (HiPco tubes). The degree of functionalization, estd. by thermal gravimetric anal., is as high as 1 in .apprx.5 **carbons** in the **nanotube** framework. The derivatized **nanotubes** exhibits remarkably improved soly. in org. solvents. The attached groups can be removed by heating in an atm. of argon. Derivatization was also accomplished by treating SWNTs with various sulfoxides employing Fenton's reagent.

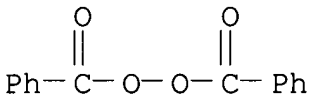
IT **7440-44-0, Carbon,** processes
(**nanotubes;** functionalization of **carbon nanotubes** by free radicals)

RN 7440-44-0 HCA
CN Carbon (7CI, 8CI, 9CI) (CA INDEX NAME)

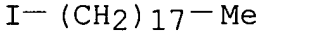
C

IT **94-36-0,** Benzoyl peroxide, processes **629-93-6,** Octadecyl iodide
(to prep. free radicals)

RN 94-36-0 HCA
CN Peroxide, dibenzoyl (9CI) (CA INDEX NAME)



RN 629-93-6 HCA
CN Octadecane, 1-iodo- (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)



CC 66-6 (Surface Chemistry and Colloids)
Section cross-reference(s): 21

ST **carbon nanotube** free radical functionalization; derivatization **carbon nanotube** free radical

IT **Nanotubes**
(**carbon**; functionalization of **carbon nanotubes** by free radicals)

IT Radicals, processes
(functionalization of **carbon nanotubes** by free radicals)

IT IR spectra
Raman spectra
(functionalization of **carbon nanotubes** by free radicals studied using)

IT **Alkyl iodides**
(to prep. free radicals)

IT **7440-44-0**, **Carbon**, processes
(**nanotubes**; functionalization of **carbon nanotubes** by free radicals)

IT 67-68-5, Dimethylsulfoxide, processes **94-36-0**, Benzoyl peroxide, processes **629-93-6**, Octadecyl iodide
(to prep. free radicals)

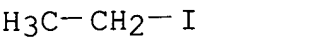
L23 ANSWER 4 OF 4 HCA COPYRIGHT 2006 ACS on STN

127:283826 Functionalized **nanotubes**. Fischer, Alan; Hoch, Robert; Moy, David; Lu, Ming; Martin, Mark; Niu, Chun Ming; Ogata, Naoya; Tennent, Howard; Dong, Liwen; Sun, Ji; Helms, Larry; Jameison, Fabian; Liang, Pam; Simpson, David (Hyperion Catalysis International, Inc., USA). PCT Int. Appl. WO 9732571 A1 19970912, 133 pp. DESIGNATED STATES: W: AM, AT, AU, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TT, UA, US, UZ, VN, YU; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (English). CODEN: PIXXD2. APPLICATION: WO 1997-US3553 19970305. PRIORITY: US 1996-37238 19960306.

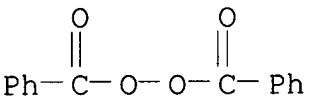
AB **Graphitic nanotubes**, which include tubular fullerenes (commonly called buckytubes) and fibrils, which are functionalized by chem. substitution or by adsorption of functional moieties are claimed. More specifically the invention relates to **graphitic nanotubes** which are uniformly or nonuniformly substituted with chem. moieties or upon which certain cyclic compds. are adsorbed and to complex structures comprised of such functionalized **nanotubes** linked to one another. The invention also relates to methods for introducing functional groups onto the surface of such **nanotubes**. The invention further relates to uses for functionalized **nanotubes**, which include enzyme immobilization for sample sepn. and immobilizing a biocatalyst capable of catalyzing a reaction on the functionalized

nanotubes.

IT **75-03-6**, Ethyl iodide
(for prepn. of triethyl(2-hydroxyethyl)ammonium iodide)
RN 75-03-6 HCA
CN Ethane, iodo- (8CI, 9CI) (CA INDEX NAME)



IT **94-36-0**, Benzoyl peroxide, reactions
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
RN 94-36-0 HCA
CN Peroxide, dibenzoyl (9CI) (CA INDEX NAME)



IC ICM A61K009-00
ICS A01N025-00; C09C001-56; B32B005-16
CC 66-4 (Surface Chemistry and Colloids)
Section cross-reference(s): 7
ST **carbon nanotube** fibril surface functionalization; enzyme immobilization surface functionalized carbon fibril
IT Dendritic polymers
(**carbon nanotube** and fibril surface bonded; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT **Nanotubes**
(**carbon**, surface functionalized; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT Fibril
(carbon; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT Immobilization, biochemical
(enzyme; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT Electrodes
(flow-through; surface functionalization of **carbon nanotubes** and fibrils for substance immobilization)
IT Enzymes, processes
(immobilized; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT Solid phase synthesis

(peptide; surface functionalization of **carbon nanotubes** and fibrils for substance immobilization)
IT Albumins, processes
(serum; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT Affinity chromatographic stationary phases
Functional groups
Surface reaction
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT Avidins
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT Immunoglobulins
(surface functionalization of **carbon nanotubes** and fibrils for protein immobilization)
IT Polyoxyalkylenes, processes
(surface reaction product with **carbon nanotubes** and fibrils; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT Lactoglobulins
(.beta.-; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT 7440-57-5, Gold, reactions
(attachment of thiol modified **carbon nanotubes** to gold surfaces)
IT **75-03-6**, Ethyl iodide 100-37-8, N,N-Diethylethanolamine
(for prepn. of triethyl(2-hydroxyethyl)ammonium iodide)
IT 5957-17-5P, Triethyl(2-hydroxyethyl)ammonium iodide
(prepn. and reaction with **carbon nanotube** and fibrils surfaces)
IT 653-37-2, Pentafluorobenzaldehyde
(reaction with ethylenediamine surface bonded to surface of **carbon nanotubes** and fibrils)
IT 9013-20-1, Streptavidin
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT 9001-62-1, Lipase
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT 9002-07-7, Trypsin
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT 9001-78-9, Alkaline phosphatase 9035-51-2, Cytochrome P450, processes
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT 6066-82-6D, N-Hydroxysuccinimide, surface reaction product with

carbon nanotubes and fibrils
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 25322-68-3DP, surface reaction product with **carbon nanotubes** and fibrils
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT **94-36-0**, Benzoyl peroxide, reactions 9003-99-0, Peroxidase
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 107-15-3DP, 1,2-Ethanediamine, surface reaction product with **carbon nanotubes** and fibrils, reactions 109-02-4DP, surface reaction product with **carbon nanotubes** and fibrils 7775-09-9DP, Sodium chlorate, surface reaction product with **carbon nanotubes** and fibrils 23586-53-0DP, Thallium(III) trifluoroacetate, surface reaction product with **carbon nanotubes** and fibrils 30189-36-7DP, Bis(tert-butoxycarbonyl)lysine-N-hydroxysuccinimide, surface reaction product with **carbon nanotubes** and fibrils 65915-94-8P, N-tert-Butoxycarbonyl-1,6-diaminohexane hydrochloride 79849-03-9DP, Nitrilotriacetic acid hydrochloride, surface reaction product with **carbon nanotubes** and fibrils
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 56-87-1DP, L-Lysine, carbon fibril bonded, preparation 58-85-5DP, Biotin, surface reaction product with carbon fibrils 60-24-2DP, Monothioethylene glycol, surface reaction product with **carbon nanotubes** and fibrils 75-89-8DP, 2,2,2-Trifluoroethanol, surface reaction product with **carbon nanotubes** and fibrils 79-06-1DP, 2-Propenamide, surface reaction product with **carbon nanotubes** and fibrils, preparation 79-10-7DP, 2-Propenoic acid, surface reaction product with **carbon nanotubes** and fibrils, preparation 107-02-8DP, Propenal, surface reaction product with **carbon nanotubes** and fibrils 107-11-9DP, 3-Amino-1-propene, surface reaction product with **carbon nanotubes** and fibrils 107-13-1DP, 2-Propenenitrile, surface reaction product with **carbon nanotubes** and fibrils, preparation 107-18-6DP, 2-Propen-1-ol, surface reaction product with **carbon nanotubes** and fibrils, preparation 108-31-6DP, 2,5-Furandione, surface reaction product with **carbon nanotubes** and fibrils, preparation 109-72-8DP, Butyllithium, surface reaction product with **carbon nanotubes** and fibrils 110-16-7DP, 2-Butenedioic acid (Z)-, surface reaction product with **carbon nanotubes** and fibrils 111-86-4DP, 1-Octanamine, surface reaction product with **carbon**

nanotubes and fibrils 124-30-1DP, 1-Octadecanamine, surface reaction product with **carbon nanotubes** and fibrils 151-50-8DP, Potassium cyanide, surface reaction product with **carbon nanotubes** and fibrils 530-62-1DP, N,N'-Carbonyl diimidazole, surface reaction product with **carbon nanotubes** and fibrils 593-56-6DP, Methoxyamine hydrochloride, surface reaction product with **carbon nanotubes** and fibrils 814-68-6DP, Propenoyl chloride, surface reaction product with **carbon nanotubes** and fibrils 994-30-9DP, Chlorotriethylsilane, surface reaction product with **carbon nanotubes** and fibrils 1310-73-2DP, Sodium hydroxide, surface reaction product with **carbon nanotubes** and fibrils 1333-74-0DP, Hydrogen, surface reaction product with **carbon nanotubes** and fibrils, preparation 1336-21-6DP, Ammonium hydroxide, surface reaction product with **carbon nanotubes** and fibrils 1892-57-5DP, 1-Ethyl-3-(3-dimethylaminopropyl)carbodiimide, surface reaction product with **carbon nanotubes** and fibrils 2016-57-1DP, 1-Aminodecane, surface reaction product with **carbon nanotubes** and fibrils 2074-87-5DP, Cyanogen, surface reaction product with **carbon nanotubes** and fibrils 4048-33-3DP, 6-Aminohexan-1-ol, surface reaction product with **carbon nanotubes** and fibrils 4781-83-3DP, 2-Iminothiolane hydrochloride, surface reaction product with **carbon nanotubes** and fibrils 5591-94-6DP, surface reaction product with **carbon nanotubes** and fibrils 5957-17-5DP, Triethyl(2-hydroxyethyl)ammonium iodide, surface reaction product with **carbon nanotubes** and fibrils 7664-41-7DP, Ammonia, surface reaction product with **carbon nanotubes** and fibrils, preparation 7664-93-9DP, Sulfuric acid, surface reaction product with **carbon nanotubes** and fibrils, preparation 7697-37-2DP, Nitric acid, surface reaction product with **carbon nanotubes** and fibrils, preparation 7704-34-9DP, Sulfur, surface reaction product with **carbon nanotubes** and fibrils, preparation 7732-18-5DP, Water, surface reaction product with **carbon nanotubes** and fibrils, preparation 7782-44-7DP, Oxygen, surface reaction product with **carbon nanotubes** and fibrils, preparation 13214-66-9DP, 4-Phenylbutylamine, surface reaction product with **carbon nanotubes** and fibrils 19008-71-0DP, 8-Aminooctan-1-ol, surface reaction product with **carbon nanotubes** and fibrils 23160-46-5DP, 10-Aminodecan-1-ol, surface reaction product with **carbon nanotubes** and fibrils 103708-09-4DP, Sulfosuccinimidyl-4-(N-maleimidomethyl)cyclohexanecarboxylate, surface reaction product with **carbon nanotubes** and fibrils

142755-63-3DP, 18-Aminooctadecan-1-ol, surface reaction product with **carbon nanotubes** and fibrils
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT 53-84-9, NAD
(surface functionalization of **carbon nanotubes** and fibrils for prepn. of affinity matrixes)
IT 9001-60-9P, Lactate dehydrogenase
(surface functionalization of **carbon nanotubes** and fibrils for prepn. of affinity matrixes)

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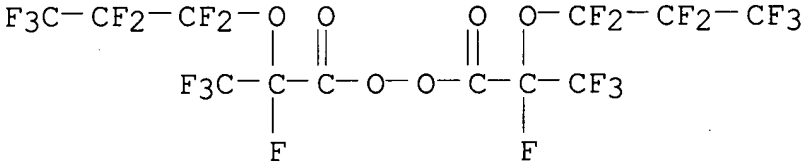
L24 ANSWER 1 OF 15 HCA COPYRIGHT 2006 ACS on STN
144:350405 Preparation of functionalized carbon materials. Krusic, Paul J.; Law, Clarence G.; Lu, Helen S. M.; Yang, Zhen-Yu; Garner, Joselyn Hicks (E.I. Dupont de Nemours and Company, USA). PCT Int. Appl. WO 2006023921 A2 20060302, 77 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IS, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2005-US29972 20050819. PRIORITY: US 2004-2004/PV603215 20040820.
AB This invention relates to carbon materials, such as a fullerene mol. or a curved carbon nanostructure (e.g. **carbon nanotubes**), that are functionalized by addn. chem. performed on surface C-C double bond. More specifically, a fullerene mol. comprising n carbon atoms wherein m groups described generally by the formula -C(F2)-C(-)(F)-Oa-[C(F2)-C(F)(R)]b-Oc-[C(F2)]d-T are each covalently bonded to the fullerene through formation of a 4-member ring with the unsatd. pi system of the fullerene [wherein a = 0,1; b = 0-10; c = 0,1; d = 1-10; R = independently H, F, Me, branched or straight-chain perfluorinated C1-10 alkyl, Ph, or perfluorinated aryl; T = each independently CO2H, SO3H, SO2NH2, SO2NHSO2J, or -PO3H2; J = each independently F, Me, branched or straight-chain perfluorinated C1-10 alkyl, Ph, or perfluorinated aryl; n = an integer of 20-1000, preferably 60-100; m = an integer from 1 to n/2 when n is an even integer, or m is an integer from 1 to (n-yl)/2 when n is an odd integer] is prepd. Thus, fullerene C60 (50 mg), 20 mL 1,2,4-trichlorobenzene, and 3 g perfluoro(3-oxopent-4-ene)sulfonyl fluoride were charged into a 70 cc stainless steel reactor, cooled to -50.degree., evacuated, filled with nitrogen, and

then heated to 200.degree. for 18 h to give, after removing the solvent under vacuum, a brown solid. MALDI mass spectra showed masses at 720 and multiple products with masses that are multiples of 282 (mass of monomer) added to 720. The soln. 19F NMR spectrum confirmed that the bonding of the vinyl ether mols. with C60 was of the 2+2 functionalized type.

IT **56347-79-6**, Bis(perfluoro-2-propoxypropanoyl) peroxide
(prepn. of functionalized carbon materials by addn. reaction on surface carbon-carbon double bond of fullerenes)

RN 56347-79-6 HCA

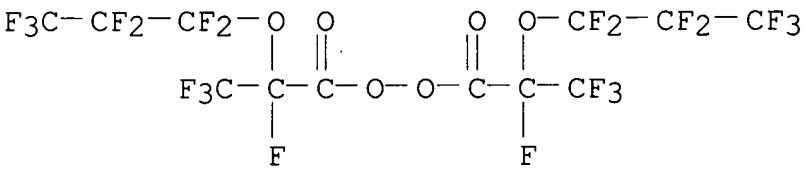
CN Peroxide, bis[2,3,3,3-tetrafluoro-2-(heptafluoropropoxy)-1-oxopropyl] (9CI) (CA INDEX NAME)



IT **56347-79-6DP**, Bis(perfluoro-2-propoxypropanoyl) peroxide, addn. products with **carbon nanotubes**
(prepn. of functionalized **carbon** materials by addn. reaction on surface carbon-carbon double bond of fullerenes)

RN 56347-79-6 HCA

CN Peroxide, bis[2,3,3,3-tetrafluoro-2-(heptafluoropropoxy)-1-oxopropyl] (9CI) (CA INDEX NAME)



IC ICM C01B

CC 25-29 (Benzene, Its Derivatives, and Condensed Benzenoid Compounds)
Section cross-reference(s): 76

ST fullerene oxaalkenesulfonyl chloride cycloaddn product prepn; **carbon nanotube** cycloaddn product prepn

IT **Nanotubes**
(**carbon**, cycloaddn. products with perfluoro(oxaalkene)sulfonyl fluorides, peroxide, or perfluoroalkyl iodides; prepn. of functionalized carbon materials by addn. reaction on surface carbon-carbon double bond of fullerenes)

IT Films
(elec. conductive, hydrolyzed products of **carbon**

nanotubes cycloaddn. products with perfluoro(oxapentene)sulfonyl fluoride; prepn. of functionalized carbon materials by addn. reaction on surface carbon-carbon double bond of fullerenes)

IT Electric conductors
(films, hydrolyzed products of **carbon nanotubes** cycloaddn. products with perfluoro(oxapentene)sulfonyl fluoride; prepn. of functionalized carbon materials by addn. reaction on surface carbon-carbon double bond of fullerenes)

IT Electric conductors
(hydrolyzed products of **carbon nanotubes** cycloaddn. products with perfluoro(oxapentene)sulfonyl fluoride; prepn. of functionalized carbon materials by addn. reaction on surface carbon-carbon double bond of fullerenes)

IT 355-43-1, Perfluorohexyl iodide 507-63-1, Perfluorooctyl iodide 16090-14-5, Perfluoro(4-methyl-3,6-dioxaoct-7-ene)sulfonyl fluoride 29514-94-1, Perfluoro(3-oxapent-4-ene)sulfonyl fluoride **56347-79-6**, Bis(perfluoro-2-propoxypropanoyl) peroxide 99685-96-8, Fullerene C60
(prepn. of functionalized carbon materials by addn. reaction on surface carbon-carbon double bond of fullerenes)

IT 355-43-1DP, Perfluorohexyl iodide, addn. products with **carbon nanotubes carbon** black 507-63-1DP, Perfluorooctyl iodide, addn. products with **carbon nanotubes** 7440-06-4DP, Platinum, supported on TKK TEC10 carbon black 7440-06-4DP, Platinum, supported on TKK TEC10 carbon black, [2+2]cycloaddn. products with perfluoro(3-oxapent-4-ene)sulfonyl chloride 16090-14-5DP, [2+2]cycloaddn. products with **carbon nanotubes** 29514-94-1DP, [2+2]cycloaddn. products with fullerene C60, hydrolyzed **56347-79-6DP**, Bis(perfluoro-2-propoxypropanoyl) peroxide, addn. products with **carbon nanotubes** 99685-96-8DP, Fullerene C60, [2+2]cycloaddn. products with perfluoro(3-oxapent-4-ene)sulfonyl fluoride, hydrolyzed
(prepn. of functionalized **carbon** materials by addn. reaction on surface carbon-carbon double bond of fullerenes)

L24 ANSWER 2 OF 15 HCA COPYRIGHT 2006 ACS on STN
144:313149 Production of polymer nanocomposites having an exfoliated clay randomly dispersed therein. Yang, Kumin; Doyle, Nathan; Ozisik, Rahmi (USA). U.S. Pat. Appl. Publ. US 2006066012 A1 20060330, 23 pp. (English). CODEN: USXXCO. APPLICATION: US 2004-949634 20040924.

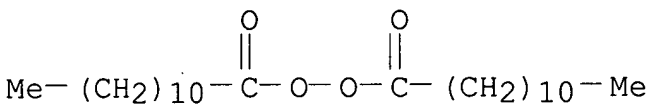
AB The method comprises the steps of: (a) mixing a peroxide-degradable polymer, a clay, and a peroxide to form a polymer-clay-peroxide mixt., and (b) heating the polymer-clay-peroxide mixt. to form a polymer-clay-peroxide melt contg. peroxide radicals, resulting in: degrdn. of the peroxide-degradable polymer within the melt to form

smaller mol. wt. polymer chains via the peroxide radicals; a diffusion of the polymer chains into the clay within the melt so as to exfoliate the clay to form a title polymer nanocomposite.

IT **105-74-8**, Dilauroylperoxide
(prodn. of polymer nanocomposites having an exfoliated clay randomly dispersed therein)

RN 105-74-8 HCA

CN Peroxide, bis(1-oxododecyl) (9CI) (CA INDEX NAME)



INCL 264349000; 366348000

CC 37-6 (Plastics Manufacture and Processing)

IT **Nanotubes**
(**carbon**; prodn. of polymer nanocomposites having an exfoliated clay randomly dispersed therein)

IT 75-91-2, tert-Butyl hydroperoxide 78-63-7, 2,5-Dimethyl-2,5-di(tert-butylperoxy) hexane 80-43-3, Dicumyl peroxide **105-74-8**, Dilauroylperoxide 110-05-4, Di-tert-butyl peroxide 614-45-9, tert-Butylperoxybenzoate 1068-27-5, 2,5-Dimethyl-2,5-di(tert-butylperoxy)hexyne-3 3006-82-4, tert-Butyl peroxy-2-ethylhexanoate 3179-56-4, Acetyl cyclohexane sulfonyl peroxide 25155-25-3, Bis(tert-butylperoxy)diisopropyl benzene
(prodn. of polymer nanocomposites having an exfoliated clay randomly dispersed therein)

L24 ANSWER 3 OF 15 HCA COPYRIGHT 2006 ACS on STN

144:111276 Fuel cell using supported catalyst. Kim, Hae-Kyoung; Pak, Chan-Ho; Chang, Hyuk; Suh, Sang-Hyuk; Yoo, Dae-Jong (Samsung Sdi Co., Ltd., S. Korea). Eur. Pat. Appl. EP 1615279 A2 20060111, 12 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, PL, SK, BA, HR, IS, YU. (English). CODEN: EPXXDW. APPLICATION: EP 2005-254214 20050705. PRIORITY: KR 2004-52970 20040708.

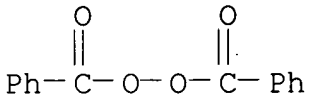
AB A supported catalyst, an electrode including the same, and a fuel cell using the electrode are provided. The supported catalyst includes a carbon-based catalyst support, catalytic metal particles adsorbed on a surface of the carbon-based catalyst support, and an ionomer chem. or phys. absorbed to the surface of the carbon-based catalyst support and having a functional group capable of providing proton cond. on an end. In the supported catalyst, the catalyst support performs an essential function of transporting protons in the formation of an electrode, thereby increasing the efficiency.

When using an electrode prepd. using the supported catalyst, a fuel cell having improved performances, such as energy d. and efficiency of fuel, can be prepd.

IT **7440-44-0**, Carbon, uses
(fuel cell using supported catalyst)
RN 7440-44-0 HCA
CN Carbon (7CI, 8CI, 9CI) (CA INDEX NAME)

C

IT **94-36-0**, Benzoylperoxide, processes
(fuel cell using supported catalyst)
RN 94-36-0 HCA
CN Peroxide, dibenzoyl (9CI) (CA INDEX NAME)



CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38

IT Molecular sieves
Nanotubes
(**carbon**; fuel cell using supported catalyst)

IT **7440-44-0**, Carbon, uses
(fuel cell using supported catalyst)

IT **94-36-0**, Benzoylperoxide, processes 2895-03-6, Lauryl peroxide 7664-93-9, Sulfuric acid, processes 15092-81-6, Peroxydisulfate ((SO3)2O22-) 180049-13-2, Aluminum boride nitride (AlBN)
(fuel cell using supported catalyst)

L24 ANSWER 4 OF 15 HCA COPYRIGHT 2006 ACS on STN
144:52043 Nanotube brushes: polystyrene grafted covalently on CNx nanotubes by nitroxide-mediated radical polymerization. Dehonor, M.; Masenelli-Varlot, K.; Gonzalez-Montiel, A.; Gauthier, C.; Cavaille, J. Y.; Terrones, H.; Terrones, M. (Advanced Materials Department, IPICYT, San Luis Potosi, 78216, Mex.). Chemical Communications (Cambridge, United Kingdom) (42), 5349-5351 (English) 2005. CODEN: CHCOFS. ISSN: 1359-7345. Publisher: Royal Society of Chemistry.

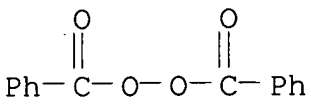
AB Polymer brushes consisting of polystyrene (PS) chains bonded covalently to N-doped multiwalled **carbon nanotubes** (CNx) were synthesized by a "grafting from" route using nitroxide mediated radical polymn. (NMRP).

IT **94-36-0**, Benzoyl peroxide, uses

(polystyrene grafted covalently on N-doped multiwalled **carbon nanotubes** by nitroxide-mediated radical polymn.)

RN 94-36-0 HCA

CN Peroxide, dibenzoyl (9CI) (CA INDEX NAME)



CC 35-8 (Chemistry of Synthetic High Polymers)

ST **carbon nanotube** brush polystyrene grafting nitroxide mediated

IT **Nanotubes**
(**carbon**; polystyrene grafted covalently on N-doped multiwalled **carbon nanotubes** by nitroxide-mediated radical polymn.)

IT Polymer morphology
(polystyrene grafted covalently on N-doped multiwalled **carbon nanotubes** by nitroxide-mediated radical polymn.)

IT Polymerization
Polymerization catalysts
(radical; polystyrene grafted covalently on N-doped multiwalled **carbon nanotubes** by nitroxide-mediated radical polymn.)

IT **94-36-0**, Benzoyl peroxide, uses 2226-96-2 2564-83-2, TEMPO 871132-75-1, PR-CGX 505
(polystyrene grafted covalently on N-doped multiwalled **carbon nanotubes** by nitroxide-mediated radical polymn.)

IT 161776-45-0P, Carbon-styrene graft copolymer
(polystyrene grafted covalently on N-doped multiwalled **carbon nanotubes** by nitroxide-mediated radical polymn.)

L24 ANSWER 5 OF 15 HCA COPYRIGHT 2006 ACS on STN

144:38270 Method for fabricating composite bipolar plate for fuel cell. Xin, Qin; Chen, Weimin; Sun, Gongquan; Liang, Zhenxing; Ren, Suzhen (Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Peop. Rep. China). Faming Zhuanli Shenqing Gongkai Shuomingshu CN 1591941 A 20050309, 12 pp. (Chinese). CODEN: CNXXEV. APPLICATION: CN 2003-156680 20030905.

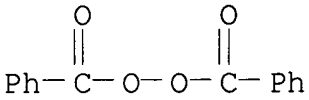
AB The title composite bipolar plate is made from thermosetting resin and fillings, and has an evenly distributed flow field on the upper and bottom surfaces and a metal plate embedded in the composite material. The title method comprises the following steps: (1)

mixing the thermosetting resin and curing agent and then adding fillings, (2) feeding above mixt. into an extruding mold and clamping, or disposing a metal plate into the central part of the mixt. to make it evenly wrapped by the mixt. and clamping for fabricating sandwiched composite bipolar plate, (3) disposing the mold into a hydraulic press with a heating and temp.-control unit, molding and shaping to obtain bipolar plate with evenly distributed flow field on the upper and bottom surfaces, and (4) curing to obtain the final product. The obtained composite bipolar plate is esp. suitable for polymer electrolyte film fuel cell as well as other electrochem. devices.

IT **94-36-0**, Benzoyl peroxide, uses
(method for fabricating composite bipolar plate for fuel cell)

RN 94-36-0 HCA

CN Peroxide, dibenzoyl (9CI) (CA INDEX NAME)



IT **7782-42-5**, **Graphite**, uses
(method for fabricating composite bipolar plate for fuel cell)

RN 7782-42-5 HCA

CN Graphite (8CI, 9CI) (CA INDEX NAME)

C

IC ICM H01M004-86
ICS H01M008-02

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

IT **Nanotubes**
(**carbon**; method for fabricating composite bipolar plate for fuel cell)

IT **94-36-0**, Benzoyl peroxide, uses 102-71-6, Triethanolamine, uses 1338-23-4, Methyl ethyl ketone peroxide
(method for fabricating composite bipolar plate for fuel cell)

IT 409-21-2, Silicon carbide, uses 7429-90-5, Aluminum, uses 7439-89-6, Iron, uses 7439-98-7, Molybdenum, uses 7440-02-0, Nickel, uses 7440-22-4, Silver, uses 7440-32-6, Titanium, uses 7440-50-8, Copper, uses 7440-57-5, Gold, uses 7440-66-6, Zinc, uses **7782-42-5**, **Graphite**, uses 11099-20-0 12070-08-5, Titanium carbide 12597-68-1, Stainless steel, uses 24938-64-5, Poly(p-phenylene terephthalamide) 25583-20-4, Titanium nitride
(method for fabricating composite bipolar plate for fuel cell)

L24 ANSWER 6 OF 15 HCA COPYRIGHT 2006 ACS on STN
144:6583 Process for functionalization of **carbon nanotubes** in acidic media. Tour, James M.; Hudson, Jared L.; Dyke, Christopher R.; Stephenson, Jason J. (William Marsh Rice University, USA). PCT Int. Appl. WO 2005113434 A1 20051201, 35 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IS, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2005-US9677 20050324. PRIORITY: US 2004-2004/PV556250 20040325.

AB The present invention is generally directed to methods of functionalizing **carbon nanotubes** (CNTs) in acidic media. By first dispersing CNTs in an acidic medium, bundled CNTs can be sepd. as individual CNTs, affording exposure of the CNT sidewalls, and thereby facilitating the functionalization of such CNTs, wherein functional groups are attached to the subsequently exposed sidewalls of these individualized CNTs. Once dispersed in this substantially unbundled state, the CNTs are functionalized according to one or more of a variety of functionalization processes. Typically, ultrasonication or noncovalent wrapping is not needed to afford such dispersion and subsequent functionalization. Addnl., such methods are easily scalable and can provide for sidewall-functionalized CNTs in large, industrial-scale quantities. Thus, purified CNTs were dispersed in oleum (20% free SO3) at 80.degree. and filtered. Sulfanilic acid was added to the dispersion, followed by NaNO2 and AIBN as a radical source, and the mixt. stirred at 80.degree. for 1 h. After workup, CNTs contg. side-wall C6H4SO3H groups was obtained.

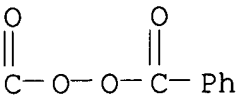
IT **7440-44-0DP, Carbon,** side-wall functionalized
(**nanotubes** single-wall; process for functionalization of **carbon nanotubes** in acidic media)
RN 7440-44-0 HCA
CN Carbon (7CI, 8CI, 9CI) (CA INDEX NAME)

C

IT **7440-44-0, Carbon,** reactions
(**nanotubes** single-wall; process for functionalization of **carbon nanotubes** in acidic media)
RN 7440-44-0 HCA
CN Carbon (7CI, 8CI, 9CI) (CA INDEX NAME)

C

IT **94-36-0**, Benzoyl peroxide, uses
(process for functionalization of **carbon nanotubes** in acidic media)
RN 94-36-0 HCA
CN Peroxide, dibenzoyl (9CI) (CA INDEX NAME)



IC ICM C01B031-02
CC 25-29 (Benzene, Its Derivatives, and Condensed Benzenoid Compounds)
Section cross-reference(s): 45
ST **carbon nanotube** side wall radical functionlization process; aryl radical **carbon nanotube** functionalization process
IT **Nanotubes**
(**carbon**, single-wall; process for functionalization of **carbon nanotubes** in acidic media)
IT **7440-44-0DP, Carbon**, side-wall functionalized
(**nanotubes** single-wall; process for functionalization of **carbon nanotubes** in acidic media)
IT **7440-44-0, Carbon**, reactions
(**nanotubes** single-wall; process for functionalization of **carbon nanotubes** in acidic media)
IT 78-67-1, 2,2'-Azo-bisisobutyronitrile **94-36-0**, Benzoyl peroxide, uses 110-05-4, Di-tert-butyl peroxide
(process for functionalization of **carbon nanotubes** in acidic media)
IT 8014-95-7, Oleum
(process for functionalization of **carbon nanotubes** in acidic media)
IT 80-82-0DP, 2-Nitrobenzenesulfonic acid, p-single-walled **carbon nanotube** functionalized 98-06-6DP, tert-Butylbenzene, p-single-walled **carbon nanotube** functionalized 98-11-3DP, Benzenesulfonic acid, p-single-walled **carbon nanotube** functionalized 27886-58-4DP, p-single-walled **carbon nanotube** functionalized 57877-23-3DP, p-single-walled **carbon nanotube** functionalized 870154-37-3DP, p-single-walled **carbon nanotube** functionalized
(process for functionalization of **carbon nanotubes** in acidic media)
IT 62-53-3, Aniline, reactions 100-01-6, 4-Nitroaniline, reactions

104-10-9, 2-(4-Aminophenyl)ethanol 106-47-8, 4-Chloroaniline, reactions 121-57-3, 4-Aminobenzenesulfonic acid 769-92-6, 4-tert-Butylaniline
(process for functionalization of **carbon nanotubes** in acidic media)

IT 1493-13-6, Triflic acid 7601-90-3, Perchloric acid, uses 7664-38-2, Phosphoric acid, uses 7664-93-9, Sulfuric acid, uses 7697-37-2, Nitric acid, uses 7790-94-5, Chlorosulfonic acid
(solvent; process for functionalization of **carbon nanotubes** in acidic media)

L24 ANSWER 7 OF 15 HCA COPYRIGHT 2006 ACS on STN
143:408203 Reversible oxidation of **carbon nanotubes**.
Diner, Bruce A.; Zheng, Ming (USA). U.S. Pat. Appl. Publ. US 2005232844 A1 20051020, 20 pp. (English). CODEN: USXXCO. APPLICATION: US 2005-69604 20050301. PRIORITY: US 2004-2004/PV54931U 20040302; US 2004-2004/PV570160 20040512.

AB **Carbon nanotubes** have been reversibly and readily oxidized and reduced with common chems. in soln., allowing the **nanotubes** to be used as catalysts for chem. reactions and as stable charge storage devices.

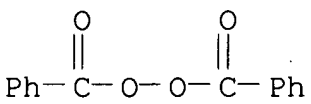
IT **7440-44-0, Carbon**, uses
(**nanotubes**, multiwalled, single walled; reversible oxidn. of **carbon nanotubes**)

RN 7440-44-0 HCA
CN Carbon (7CI, 8CI, 9CI) (CA INDEX NAME)

C

IT **94-36-0**, Benzoyl peroxide, uses
(reversible oxidn. of **carbon nanotubes**)

RN 94-36-0 HCA
CN Peroxide, dibenzoyl (9CI) (CA INDEX NAME)



IC ICM H01M008-20
ICS D01F009-12; H01L025-00

INCL 423447200; 429105000; 204433000; 136244000

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 35, 46, 47, 49, 67

ST **carbon nanotube** redox reaction catalyst solar cell sensor

IT Acid halides

(acid chlorides; reversible oxidn. of **carbon nanotubes**)
IT Amines, uses
(arom.; reversible oxidn. of **carbon nanotubes**)
IT **Nanotubes**
(**carbon**, multiwalled, single walled; reversible oxidn. of **carbon nanotubes**)
IT Imines
(diimines; reversible oxidn. of **carbon nanotubes**)
IT Solar cells
(dye-sensitized; reversible oxidn. of **carbon nanotubes**)
IT Sensors
(electrochem.; reversible oxidn. of **carbon nanotubes**)
IT Solvents
(org.; reversible oxidn. of **carbon nanotubes**)
IT Dyes
(photosensitizing; reversible oxidn. of **carbon nanotubes**)
IT Carbohydrates, uses
(reducing sugars; reversible oxidn. of **carbon nanotubes**)
IT Detergents
Dispersing agents
Oxidizing agents
Redox reaction catalysts
Reducing agents
pH electrodes
(reversible oxidn. of **carbon nanotubes**)
IT Alkali metals, uses
Alkaline earth metals
Hydrides
Nucleic acids
Peptide nucleic acids
Peroxy acids
Phosphates, uses
Phosphines
Polymers, uses
Polyoxyalkylenes, uses
Polyphosphates
Polysaccharides, uses
Proteins
RNA
Sulfates, uses
Sulfides, uses

Transition metals, uses
(reversible oxidn. of **carbon nanotubes**)

IT Nanostructures
(ropes; reversible oxidn. of **carbon nanotubes**)

IT Sulfonic acids, uses
(salts, alkyl ethers; reversible oxidn. of **carbon nanotubes**)

IT Electron transfer
(substances; reversible oxidn. of **carbon nanotubes**)

IT **7440-44-0, Carbon**, uses
(**nanotubes**, multiwalled, single walled; reversible oxidn. of **carbon nanotubes**)

IT 64-17-5, Ethanol, uses 67-56-1, Methanol, uses 67-63-0, Isopropanol, uses 25321-22-6, Dichlorobenzene
(reversible oxidn. of **carbon nanotubes**)

IT 50-69-1, D-Ribose 50-99-7, D-Glucose, uses 57-50-1, Saccharose, uses 60-00-4, EDTA, uses 62-56-6, Thiourea, uses 64-18-6, Formic acid, uses 79-21-0, Peracetic acid 84-58-2, 2,3-Dichloro-5,6-dicyano-p-benzoquinone 88-67-5 91-15-6, Phthalonitrile 91-20-3, Naphthalene, uses **94-36-0**, Benzoyl peroxide, uses 98-11-3D, Benzenesulfonic acid, alkyl esters 103-30-0 106-51-4, p-Benzoquinone, uses 118-75-2, Chloranil, uses 119-61-9, Benzophenone, uses 128-08-5, N-Bromosuccinimide 128-09-6, N-Chlorosuccinimide 130-15-4, 1,4-Naphthalenedione 151-21-3, Sodium dodecyl sulfate, uses 198-55-0, Perylene 229-87-8, Phenanthridine 260-94-6, Acridine 302-01-2, Hydrazine, uses 516-12-1, N-Iodosuccinimide 553-97-9, p-Toluquinone 583-63-1, o-Benzoquinone 630-08-0, Carbon monoxide, uses 1111-67-7 1310-73-2, Sodium hydroxide, uses 1333-74-0, Hydrogen, uses 1499-10-1, 9,10-Diphenylanthracene 1515-72-6, N-n-Butylphthalimide 2435-53-2, o-Chloranil 3457-53-2, Stilbenequinone 4981-66-2, Anthraquinol 7440-32-6, Titanium, uses 7553-56-2, Iodine, uses 7601-90-3, Perchloric acid, uses 7647-14-5, Sodium chloride, uses 7664-93-9, Sulfuric acid, uses 7681-65-4, Copper iodide (CuI) 7697-37-2, Nitric acid, uses 7704-34-9, Sulfur, uses 7722-64-7, Potassium permanganate 7722-84-1, Hydrogen peroxide, uses 7722-86-3, Persulfuric acid 7782-44-7, Oxygen, uses 7782-50-5, Chlorine, uses 7782-77-6, Nitrous acid 7790-92-3, Hypochlorous acid 9000-01-5, Gum arabic 9002-93-1, Triton X405 9003-39-8, Polyvinylpyrrolidone 9004-53-9, Dextrin 9083-53-8, Triton (surfactant) 10028-15-6, Ozone, uses 10043-01-3, Aluminum sulfate 12179-38-3 12674-33-8, Perboric acid 13283-31-3, Borane, uses 13465-41-3, Permanganic acid 13598-52-2, Phosphoroperoxoic acid 14213-97-9, Borate 14265-45-3, Sulfite 14333-13-2, Permanganate 14383-50-7, Thiosulfate ($2O32-)

14648-50-1 14691-59-9, Peroxide (HO21-) 14797-55-8, Nitrate, uses 14797-73-0, Perchlorate 14844-07-6, Dithionite 14915-07-2, Peroxide 15092-81-6, Peroxydisulfate ((SO3)2O22-) 15121-26-3D, Vanadium 2+, salts, uses 15181-46-1, Bisulfite 15438-31-0D, Iron 2+, salts, uses 15460-68-1, Hypophosphite 15536-54-6, Tetrathionate 16853-85-3, Lithium aluminum hydride 16920-56-2 16940-66-2, Sodium borohydride 19121-78-9, Iridate(2-), hexabromo, dipotassium 22541-75-9D, Trivalent titanium, salts, uses 22541-77-1D, Vanadium 3+, salts, uses 22541-79-3D, Chromium 2+, salts, uses 22541-83-9D, Niobium 3+, salts, uses 25322-68-3, Polyethylene oxide 29063-50-1 39349-73-0, Perborate 50851-57-5 216166-55-1 756418-94-7 (reversible oxidn. of **carbon nanotubes**)

L24 ANSWER 8 OF 15 HCA COPYRIGHT 2006 ACS on STN

142:337460 Fabrication of **carbon nanotube** reinforced epoxy polymer composites using functionalized **carbon nanotubes**. Khabashesku, Valery N.; Zhu, Jiang; Peng, Haiqing; Barrera, Enrique V.; Margrave, John L. (William Marsh Rice University, USA; Margrave, Mary Lou Hf). PCT Int. Appl. WO 2005028174 A2 20050331, 75 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2004-US19188 20040616. PRIORITY: US 2003-2003/PV47893U 20030616; US 2003-2003/PV490556 20030728.

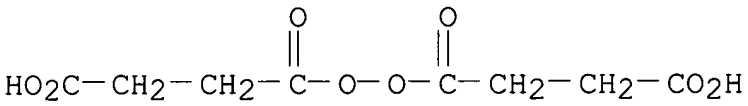
AB The present invention is directed to methods of integrating **carbon nanotubes** into epoxy polymer composites via chem. functionalization of **carbon nanotubes**, and to the **carbon nanotube**-epoxy polymer composites produced by such methods. Integration is enhanced through improved dispersion and/or covalent bonding with the epoxy matrix during the curing process. Such methods involve the attachment of chem. moieties (i.e., functional groups) to the sidewall and/or end-cap of **carbon nanotubes** such that the chem. moieties react with either the epoxy precursor(s) or the curing agent(s) (or both) during the curing process. These or addnl. chem. moieties can function to facilitate dispersion of the **carbon nanotubes** by decreasing the van der Waals attractive forces between the **nanotubes**. Thus, 500 mg BuckyPearls was treated with a mixt. of sulfuric acid-nitric acid under sonication for 1 h at room temp., hydrochloric acid was added therein to give acid-treated **nanotube**, which was fluorinated under a gas

mixt. of fluorine/hydrogen/helium (flow rate = 12:1:30) at 150.degree. for 12 h, 1% of the resulting fluorinated acid-treated **nanotube** was mixed with Epon 100 parts 862 and 26 parts Epicure W and stirred, cast into an aluminum mold, cured at 100.degree. under 0.3 MPa for 2 h and 160.degree. for 2 h to give a test piece with Young's modulus 2632 MPa and tensile strength 95.0 MPa.

IT **123-23-9DP**, Succinic acid peroxide, reaction products with carboxy-modified **nanotubes**, thionyl chloride, and diamines (fabrication of **carbon nanotube** reinforced epoxy polymer composites using functionalized **carbon nanotubes**)

RN 123-23-9 HCA

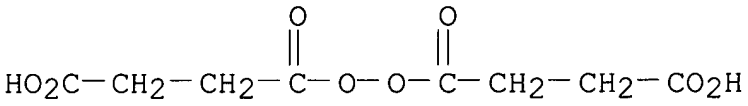
CN Butanoic acid, 4,4'-dioxybis[4-oxo- (9CI) (CA INDEX NAME)



IT **123-23-9**, Succinic acid peroxide (**nanotube** modifier; fabrication of **carbon nanotube** reinforced epoxy polymer composites using functionalized **carbon nanotubes**)

RN 123-23-9 HCA

CN Butanoic acid, 4,4'-dioxybis[4-oxo- (9CI) (CA INDEX NAME)



IT **7440-44-0DP**, BuckyPearls, functionalized (**nanotubes**; fabrication of **carbon nanotube** reinforced epoxy polymer composites using functionalized **carbon nanotubes**)

RN 7440-44-0 HCA

CN Carbon (7CI, 8CI, 9CI) (CA INDEX NAME)

C

IC ICM B29B015-10
ICS D06M015-55; D06M013-11; D06M013-196; D06M011-52; D06M011-09

CC 38-3 (Plastics Fabrication and Uses)
Section cross-reference(s): 40

ST **carbon nanotube** reinforced epoxy composite functionalized **nanotube** fabrication; BuckyPearls acid

treatment fluorination Epon Epicure copolymer composite

IT Epoxy resins, uses
(acrylates, composite with functionalized **nanotubes**; fabrication of **carbon nanotube** reinforced epoxy polymer composites using functionalized **carbon nanotubes**)

IT **Peroxides**, reactions
(**acyl**, **nanotube** modifiers; fabrication of **carbon nanotube** reinforced epoxy polymer composites using functionalized **carbon nanotubes**)

IT Polyamide fibers, uses
(aramid, coated with functionalized **nanotubes**, composite with polymers; fabrication of **carbon nanotube** reinforced epoxy polymer composites using functionalized **carbon nanotubes**)

IT Polyimides, uses
(bismaleimide-based, composite with functionalized **nanotubes**; fabrication of **carbon nanotube** reinforced epoxy polymer composites using functionalized **carbon nanotubes**)

IT Epoxy resins, uses
(brominated, amine-cured; fabrication of **carbon nanotube** reinforced epoxy polymer composites using functionalized **carbon nanotubes**)

IT **Nanotubes**
(**carbon**, functionalized; fabrication of **carbon nanotube** reinforced epoxy polymer composites using functionalized **carbon nanotubes**)

IT Fibrous materials
(coated with functionalized **nanotubes**, composite with polymers; fabrication of **carbon nanotube** reinforced epoxy polymer composites using functionalized **carbon nanotubes**)

IT Carbon fibers, uses
Glass fiber fabrics
Glass fibers, uses
(coated with functionalized **nanotubes**, composite with polymers; fabrication of **carbon nanotube** reinforced epoxy polymer composites using functionalized **carbon nanotubes**)

IT Fibers
(coated with functionalized **nanotubes**; fabrication of **carbon nanotube** reinforced epoxy polymer composites using functionalized **carbon nanotubes**)

IT Epoxy resins, uses
(crosslinked; fabrication of **carbon nanotube**

reinforced epoxy polymer composites using functionalized **carbon nanotubes**)

IT Phenolic resins, uses
(epoxy, novolak, amine-cured; fabrication of **carbon nanotube** reinforced epoxy polymer composites using functionalized **carbon nanotubes**)

IT Composites
(fabrication of **carbon nanotube** reinforced epoxy polymer composites using functionalized **carbon nanotubes**)

IT Fullerenes
(functionalized, **nanotubes**; fabrication of **carbon nanotube** reinforced epoxy polymer composites using functionalized **carbon nanotubes**)

IT Reinforced plastics
(glass fiber-reinforced; fabrication of **carbon nanotube** reinforced epoxy polymer composites using functionalized **carbon nanotubes**)

IT Alcohols, reactions
(**nanotube** modifiers; fabrication of **carbon nanotube** reinforced epoxy polymer composites using functionalized **carbon nanotubes**)

IT Epoxy resins, uses
(phenolic, novolak, amine-cured; fabrication of **carbon nanotube** reinforced epoxy polymer composites using functionalized **carbon nanotubes**)

IT 56-81-5DP, Glycerol, reaction products with fluorinated **nanotubes** **123-23-9DP**, Succinic acid peroxide, reaction products with carboxy-modified **nanotubes**, thionyl chloride, and diamines 1761-71-3DP, Bis(p-aminocyclohexyl)methane, reaction products with carbonyl-modified **nanotubes**
(fabrication of **carbon nanotube** reinforced epoxy polymer composites using functionalized **carbon nanotubes**)

IT 202817-71-8P, Epicure W-Epon 862 copolymer
(fabrication of **carbon nanotube** reinforced epoxy polymer composites using functionalized **carbon nanotubes**)

IT 56-81-5, Glycerol, reactions 80-05-7, Bisphenol A, reactions **123-23-9**, Succinic acid peroxide 1761-71-3, Bis(p-aminocyclohexyl)methane 28317-46-6, Pentanediperoxoic acid
(**nanotube** modifier; fabrication of **carbon nanotube** reinforced epoxy polymer composites using functionalized **carbon nanotubes**)

IT **7440-44-0DP**, BuckyPearls, functionalized
(**nanotubes**; fabrication of **carbon nanotube** reinforced epoxy polymer composites using

functionalized **carbon nanotubes**)

L24 ANSWER 9 OF 15 HCA COPYRIGHT 2006 ACS on STN
142:114976 Reinforcing epoxy polymer composites through covalent integration of functionalized **nanotubes**. Zhu, Jiang; Peng, Haiqing; Rodriguez-Macias, Fernando; Margrave, John L.; Khabashesku, Valery N.; Imam, Ashraf M.; Lozano, Karen; Barrera, Enrique V. (Department of Mechanical Engineering and Materials Science, Rice University, Houston, TX, 77005, USA). Advanced Functional Materials, 14(7), 643-648 (English) 2004. CODEN: AFMDC6. ISSN: 1616-301X. Publisher: Wiley-VCH Verlag GmbH & Co. KGaA.

AB Strong interfacial bonding and homogenous dispersion have been found to be necessary conditions to take full advantage of the extraordinary properties of **nanotubes** for reinforcement of composites. We have developed a fully integrated **nanotube** composite material through the use of functionalized single-walled **carbon nanotubes** (SWNTs). The functionalization was performed via the reaction of terminal diamines with alkylcarboxyl groups attached to the SWNTs in the course of a dicarboxylic acid **acyl peroxide** treatment. **Nanotube**-reinforced epoxy polymer composites were prepd. by dissolving the functionalized SWNTs in org. solvent followed by mixing with epoxy resin and curing agent. In this hybrid material system, **nanotubes** are covalently integrated into the epoxy matrix and become part of the crosslinked structure rather than just a sep. component. Results demonstrated dramatic enhancement in the mech. properties of an epoxy polymer material, for example, 30-70 % increase in ultimate strength and modulus with the addn. of only small quantities (1-4 wt.-%) of functionalized SWNTs. The **nanotube**-reinforced epoxy composites also exhibited an increased strain to failure, which suggests higher toughness.

IT **7440-44-0, Carbon**, uses
(**nanotubes**; reinforcing epoxy composites through covalent integration of functionalized **nanotubes**)

RN 7440-44-0 HCA
CN Carbon (7CI, 8CI, 9CI) (CA INDEX NAME)

C

CC 37-6 (Plastics Manufacture and Processing)
ST **nanotube** reinforcing epoxy covalent
IT **Nanotubes**
(**carbon**; reinforcing epoxy composites through covalent integration of functionalized **nanotubes**)
IT Polymer morphology
Tensile strength
Tension

Young's modulus
(reinforcing epoxy composites through covalent integration of functionalized **nanotubes**)

IT Epoxy resins, properties
(reinforcing epoxy composites through covalent integration of functionalized **nanotubes**)

IT Elongation, mechanical
Storage modulus
(reinforcing epoxy polymer composites through covalent integration of functionalized **nanotubes**)

IT **7440-44-0, Carbon**, uses
(**nanotubes**; reinforcing epoxy composites through covalent integration of functionalized **nanotubes**)

IT 25068-38-6, Epon 826
(reinforcing epoxy polymer composites through covalent integration of functionalized **nanotubes**)

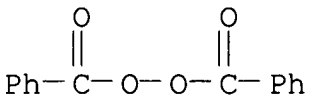
L24 ANSWER 10 OF 15 HCA COPYRIGHT 2006 ACS on STN
141:412373 Method for functionalizing **carbon nanotubes** utilizing peroxides. Khabashesku, Valery N.; Peng, Haiqing; Margrave, John L.; Margrave, Mary Lou; Billups, Wilbur Edward; Ying, Yunming (William Marsh Rice University, USA). U.S. Pat. Appl. Publ. US 2004223900 A1 20041111, 28 pp. (English). CODEN: USXXCO. APPLICATION: US 2003-714014 20031114. PRIORITY: US 2002-PV426784 20021115; US 2003-PV483817 20030630.

AB A method for functionalizing the wall of single-wall or multi-wall **carbon nanotubes** involves the use of **acyl peroxides** to generate carbon-centered free radicals. The method allows for the chem. attachment of a variety of functional groups to the wall or end cap of **carbon nanotubes** through covalent **carbon** bonds without destroying the wall or endcap structure of the **nanotube**. Carbon-centered radicals generated from **acyl peroxides** can have terminal functional groups that provide sites for further reaction with other compds. Org. groups with terminal carboxylic acid functionality can be converted to an acyl chloride and further reacted with an amine to form an amide or with a diamine to form an amide with terminal amine. The reactive functional groups attached to the **nanotubes** provide improved solvent dispersibility and provide reaction sites for monomers for incorporation in polymer structures. The **nanotubes** can also be functionalized by generating free radicals from org. sulfoxides.

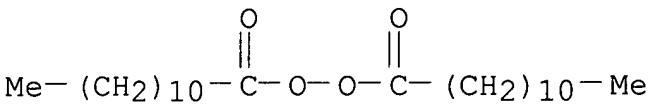
IT **94-36-0D**, Benzoyl peroxide, reaction products with **carbon nanotubes 105-74-8D**, Lauroyl peroxide, reaction products with **carbon nanotubes 110-22-5D**, Acetyl peroxide, reaction products with **carbon nanotubes 123-23-9D**, Succinic acid peroxide, reaction products with **carbon**

nanotubes 133-14-2D, Bis(2,4-dichlorobenzoyl)peroxide, reaction products with **carbon nanotubes 644-31-5D**, Acetyl benzoyl peroxide, reaction products with **carbon nanotubes 762-12-9D**, Decanoyl peroxide, reaction products with **carbon nanotubes 849-83-2D**, reaction products with **carbon nanotubes 895-85-2D**, p-Methylbenzoyl peroxide, reaction products with **carbon nanotubes 907-04-0D**, reaction products with **carbon nanotubes 925-19-9D**, reaction products with **carbon nanotubes 1607-27-8D**, reaction products with **carbon nanotubes 1607-29-0D**, reaction products with **carbon nanotubes 1712-84-1D**, p-Nitrobenzoyl peroxide, reaction products with **carbon nanotubes 1808-39-5D**, Iso-valeryl peroxide, reaction products with **carbon nanotubes 1944-79-2D**, reaction products with **carbon nanotubes 2697-95-2D**, Butyryl peroxide, reaction products with **carbon nanotubes 2697-96-3D**, Palmitoyl peroxide, reaction products with **carbon nanotubes 4904-55-6D**, reaction products with **carbon nanotubes 15036-31-4D**, Cinnamoyl peroxide, reaction products with **carbon nanotubes 16644-08-9D**, reaction products with **carbon nanotubes 54808-54-7D**, reaction products with **carbon nanotubes 791090-41-0D**, reaction products with **carbon nanotubes 791090-42-1D**, reaction products with **carbon nanotubes 791090-43-2D**, reaction products with **carbon nanotubes 791090-71-6D**, reaction products with **carbon nanotubes**
(method for functionalizing **carbon nanotubes** utilizing peroxides)

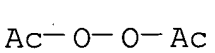
RN 94-36-0 HCA
CN Peroxide, dibenzoyl (9CI) (CA INDEX NAME)



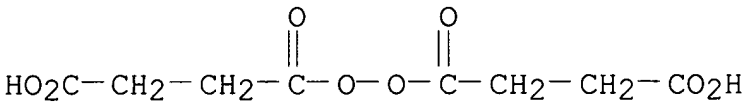
RN 105-74-8 HCA
CN Peroxide, bis(1-oxododecyl) (9CI) (CA INDEX NAME)



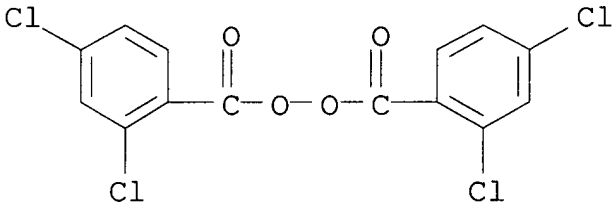
RN 110-22-5 HCA
CN Peroxide, diacetyl (9CI) (CA INDEX NAME)



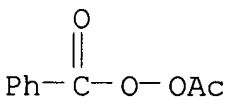
RN 123-23-9 HCA
CN Butanoic acid, 4,4'-dioxybis[4-oxo- (9CI) (CA INDEX NAME)



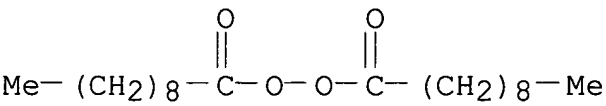
RN 133-14-2 HCA
CN Peroxide, bis(2,4-dichlorobenzoyl) (6CI, 8CI, 9CI) (CA INDEX NAME)



RN 644-31-5 HCA
CN Peroxide, acetyl benzoyl (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)

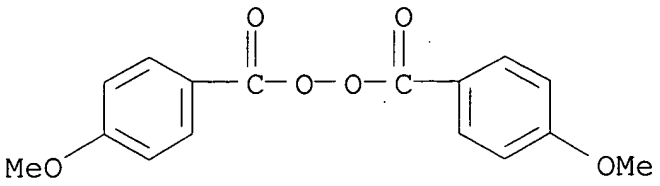


RN 762-12-9 HCA
CN Peroxide, bis(1-oxodecyl) (9CI) (CA INDEX NAME)

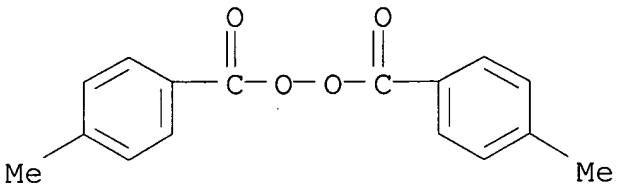


RN 849-83-2 HCA

CN Peroxide, bis(4-methoxybenzoyl) (9CI) (CA INDEX NAME)

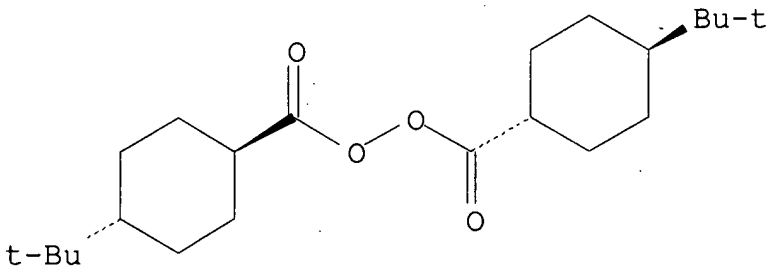


RN 895-85-2 HCA
CN Peroxide, bis(4-methylbenzoyl) (9CI) (CA INDEX NAME)

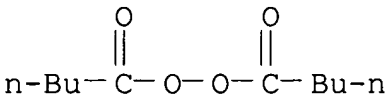


RN 907-04-0 HCA
CN Peroxide, bis[[4-(1,1-dimethylethyl)cyclohexyl]carbonyl], [trans(trans)]- (9CI) (CA INDEX NAME)

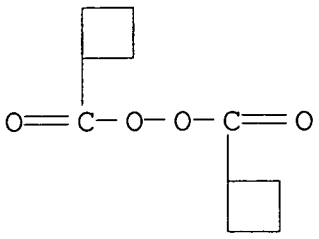
Relative stereochemistry.



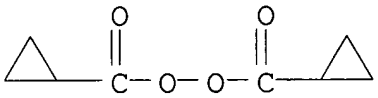
RN 925-19-9 HCA
CN Peroxide, bis(1-oxopentyl) (9CI) (CA INDEX NAME)



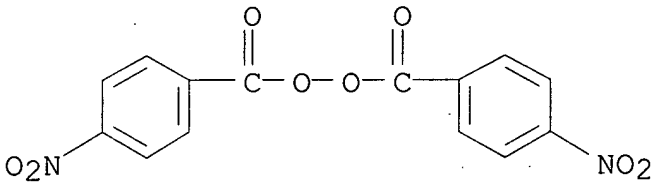
RN 1607-27-8 HCA
CN Peroxide, bis(cyclobutylcarbonyl) (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)



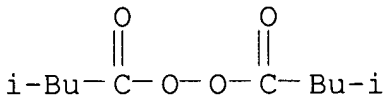
RN 1607-29-0 HCA
CN Peroxide, bis(cyclopropylcarbonyl) (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)



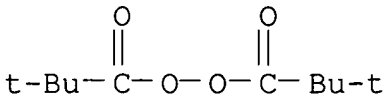
RN 1712-84-1 HCA
CN Peroxide, bis(4-nitrobenzoyl) (9CI) (CA INDEX NAME)



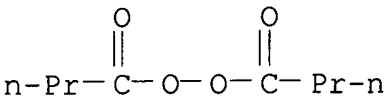
RN 1808-39-5 HCA
CN Peroxide, bis(3-methyl-1-oxobutyl) (9CI) (CA INDEX NAME)



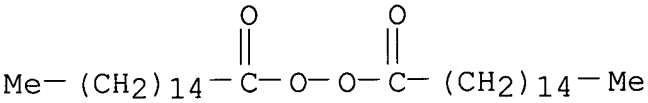
RN 1944-79-2 HCA
CN Peroxide, bis(2,2-dimethyl-1-oxopropyl) (9CI) (CA INDEX NAME)



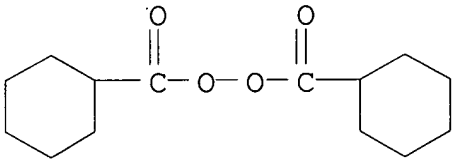
RN 2697-95-2 HCA
CN Peroxide, bis(1-oxobutyl) (9CI) (CA INDEX NAME)



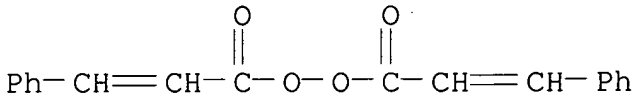
RN 2697-96-3 HCA
CN Peroxide, bis(1-oxohexadecyl) (9CI) (CA INDEX NAME)



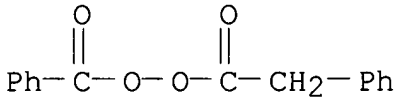
RN 4904-55-6 HCA
CN Peroxide, bis(cyclohexylcarbonyl) (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)



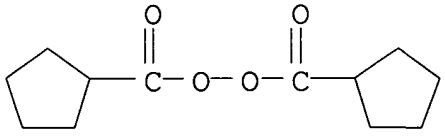
RN 15036-31-4 HCA
CN Peroxide, bis(1-oxo-3-phenyl-2-propenyl) (9CI) (CA INDEX NAME)



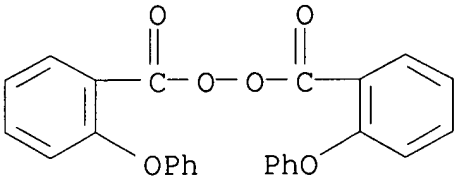
RN 16644-08-9 HCA
CN Peroxide, benzoyl phenylacetyl (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)



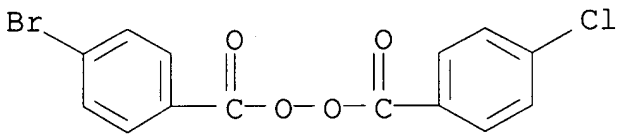
RN 54808-54-7 HCA
CN Peroxide, bis(cyclopentylcarbonyl) (6CI, 9CI) (CA INDEX NAME)



RN 791090-41-0 HCA
CN Peroxide, bis(2-phenoxybenzoyl) (9CI) (CA INDEX NAME)

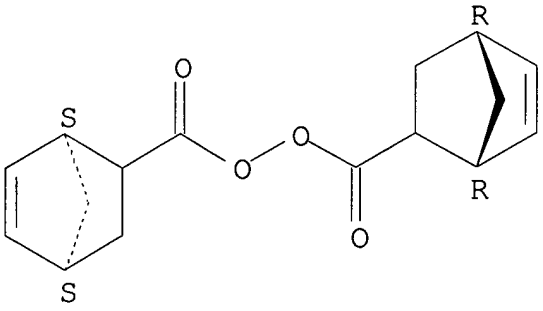


RN 791090-42-1 HCA
CN Peroxide, 4-bromobenzoyl 4-chlorobenzoyl (9CI) (CA INDEX NAME)



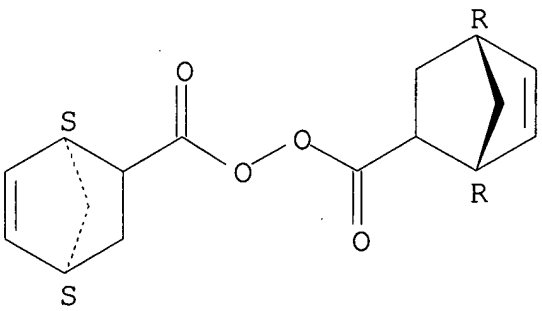
RN 791090-43-2 HCA
CN Peroxide, (1R,4R)-bicyclo[2.2.1]hept-5-en-2-ylcarbonyl (1S,4S)-bicyclo[2.2.1]hept-5-en-2-ylcarbonyl (9CI) (CA INDEX NAME)

Absolute stereochemistry.



RN 791090-71-6 HCA
CN Peroxide, (1R,4R)-bicyclo[2.2.1]hept-5-en-2-ylcarbonyl (1S,4S)-bicyclo[2.2.1]hept-5-en-2-ylcarbonyl, rel- (9CI) (CA INDEX NAME)

Relative stereochemistry.



IT **7440-44-0**, HIPCO, uses
(**nanotubes**; method for functionalizing **carbon nanotubes** utilizing peroxides)
RN 7440-44-0 HCA
CN Carbon (7CI, 8CI, 9CI) (CA INDEX NAME)

C

IC ICM D01F009-12
INCL 423447100
CC 40-2 (Textiles and Fibers)
Section cross-reference(s): 57
ST **carbon nanotube** functionalization peroxide
IT **Peroxides**, uses
(**acyl**, reaction products with **carbon nanotubes**; method for functionalizing **carbon nanotubes** utilizing peroxides)
IT **Nanotubes**
(**carbon**, functionalized; method for functionalizing **carbon nanotubes** utilizing peroxides)
IT 67-68-5D, Dimethyl sulfoxide, reaction products with **carbon nanotubes** **94-36-0D**, Benzoyl peroxide, reaction products with **carbon nanotubes** 105-64-6D, Diisopropyl peroxydicarbonate, reaction products with **carbon nanotubes** **105-74-8D**, Lauroyl peroxide, reaction products with **carbon nanotubes** 110-05-4D, tert-Butyl peroxide, reaction products with **carbon nanotubes** **110-22-5D**, Acetyl peroxide, reaction products with **carbon nanotubes** **123-23-9D**, Succinic acid peroxide, reaction products with **carbon nanotubes** 124-30-1D, Octadecylamine, reaction products with **carbon nanotubes** **133-14-2D**, Bis(2,4-dichlorobenzoyl)peroxide, reaction products with **carbon nanotubes** 614-45-9D, tert-Butyl peroxybenzoate, reaction products with **carbon**

nanotubes 644-31-5D, Acetyl benzoyl peroxide, reaction products with **carbon nanotubes 762-12-9D**, Decanoyl peroxide, reaction products with **carbon nanotubes 849-83-2D**, reaction products with **carbon nanotubes 895-85-2D**, p-Methylbenzoyl peroxide, reaction products with **carbon nanotubes 907-04-0D**, reaction products with **carbon nanotubes 925-19-9D**, reaction products with **carbon nanotubes 1607-27-8D**, reaction products with **carbon nanotubes 1607-29-0D**, reaction products with **carbon nanotubes 1712-84-1D**, p-Nitrobenzoyl peroxide, reaction products with **carbon nanotubes 1808-39-5D**, Iso-valeryl peroxide, reaction products with **carbon nanotubes 1944-79-2D**, reaction products with **carbon nanotubes** 2168-93-6D, Di-n-butyl sulfoxide, reaction products with **carbon nanotubes** 2211-89-4D, Di-iso-propyl sulfoxide, reaction products with **carbon nanotubes 2697-95-2D**, Butyryl peroxide, reaction products with **carbon nanotubes 2697-96-3D**, Palmitoyl peroxide, reaction products with **carbon nanotubes** 4253-91-2D, reaction products with **carbon nanotubes** 4715-28-0D, sec-Butyl peroxide, reaction products with **carbon nanotubes 4904-55-6D**, reaction products with **carbon nanotubes** 9004-77-7D, Poly(ethylene glycol) butyl ether, iodo, reaction products with **carbon nanotubes** 13153-06-5D, Di-sec-butyl sulfoxide, reaction products with **carbon nanotubes 15036-31-4D**, Cinnamoyl peroxide, reaction products with **carbon nanotubes 16644-08-9D**, reaction products with **carbon nanotubes** 25639-45-6D, Furoyl peroxide, reaction products with **carbon nanotubes** 27561-56-4D, reaction products with **carbon nanotubes** 28317-46-6D, Pentanediperoxoic acid, reaction products with **carbon nanotubes 54808-54-7D**, reaction products with **carbon nanotubes 791090-41-0D**, reaction products with **carbon nanotubes 791090-42-1D**, reaction products with **carbon nanotubes 791090-43-2D**, reaction products with **carbon nanotubes 791090-71-6D**, reaction products with **carbon nanotubes**
(method for functionalizing **carbon nanotubes** utilizing peroxides)

IT **7440-44-0**, HIPCO, uses
(**nanotubes**; method for functionalizing **carbon nanotubes** utilizing peroxides)

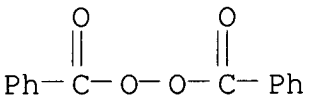
L24 ANSWER 11 OF 15 HCA COPYRIGHT 2006 ACS on STN
141:332870 Grafting of alkoxyamine end-capped (co)polymers onto multi-walled **carbon nanotubes**. Lou, Xudong; Detrembleur, Christophe; Sciannamea, Valerie; Pagnoulle, Christophe; Jerome, Robert (Center for Education and Research on Macromolecules (CERM), University of Liege, Liege, 4000, Belg.). Polymer, 45(18), 6097-6102 (English) 2004. CODEN: POLMAG. ISSN: 0032-3861. Publisher: Elsevier Ltd..

AB Multi-walled **carbon nanotubes** (MWNTs) have been successfully modified by polystyrene, poly(.vepsiln.-caprolactone), and their block copolymers by addn. reaction of the alkoxyamine-terminated precursors. Polymer-modified MWNTs are easily dispersed in good solvents for the grafted polymer, such as toluene and THF. This observation has been confirmed by TEM anal. The grafting ratio of polystyrene chains at the surface of MWNTs depends on the polymer mol. wt.

IT **94-36-0**, Benzoyl peroxide, reactions
(grafting of alkoxyamine end-capped (co)polymers onto multi-walled **carbon nanotubes**)

RN 94-36-0 HCA

CN Peroxide, dibenzoyl (9CI) (CA INDEX NAME)



IT **7440-44-0DP**, Carbon, reaction products with terminated polymers
(multi-walled, **nanotubes**; grafting of alkoxyamine end-capped (co)polymers onto multi-walled **carbon nanotubes**)

RN 7440-44-0 HCA

CN Carbon (7CI, 8CI, 9CI) (CA INDEX NAME)

C

CC 37-5 (Plastics Manufacture and Processing)

ST styrene caprolactone polymer modified **carbon nanotube** dispersion

IT UV absorption
(UV-visible; grafting of alkoxyamine end-capped (co)polymers onto multi-walled **carbon nanotubes**)

IT Polyesters, preparation
(caprolactone-based; grafting of alkoxyamine end-capped (co)polymers onto multi-walled **carbon nanotubes**

)

IT **Nanotubes**
(**carbon**, multi-walled; grafting of alkoxyamine end-capped (co)polymers onto multi-walled **carbon nanotubes**)

IT Dispersion (of materials)
Microstructure
Nanocomposites
Thermal stability
(grafting of alkoxyamine end-capped (co)polymers onto multi-walled **carbon nanotubes**)

IT 24980-41-4DP, Poly(.epsilon.-caprolactone), alkoxyamine-terminated, reaction products with **carbon nanotubes**
194727-83-8DP, reaction products with **carbon nanotubes**
(grafting of alkoxyamine end-capped (co)polymers onto multi-walled **carbon nanotubes**)

IT 9003-53-6DP, Polystyrene, alkoxyamine-terminated, reaction products with **carbon nanotubes** 106107-55-5DP, .epsilon.-Caprolactone-styrene block copolymer, alkoxyamine-terminated, reaction products with **carbon nanotubes**
(grafting of alkoxyamine end-capped (co)polymers onto multi-walled **carbon nanotubes**)

IT **94-36-0**, Benzoyl peroxide, reactions 2564-83-2, TEMPO 85664-55-7, N-tert-Butyl-.alpha.-isopropylnitrone 161776-41-6
(grafting of alkoxyamine end-capped (co)polymers onto multi-walled **carbon nanotubes**)

IT **7440-44-0DP**, Carbon, reaction products with terminated polymers
(multi-walled, **nanotubes**; grafting of alkoxyamine end-capped (co)polymers onto multi-walled **carbon nanotubes**)

L24 ANSWER 12 OF 15 HCA COPYRIGHT 2006 ACS on STN
140:86378 Sidewall Carboxylic Acid Functionalization of Single-Walled **Carbon Nanotubes**. Peng, Haiqing; Alemany, Lawrence B.; Margrave, John L.; Khabashesku, Valery N. (Department of Chemistry and the Center for Nanoscale Science and Technology, Rice University, Houston, TX, 77005-1892, USA). Journal of the American Chemical Society, 125(49), 15174-15182 (English) 2003. CODEN: JACSAT. ISSN: 0002-7863. OTHER SOURCES: CASREACT 140:86378. Publisher: American Chemical Society.

Applicants

AB The reactions of single-walled **carbon nanotubes** (SWNTs) with succinic or glutaric acid **acyl peroxides** in o-dichlorobenzene at 80-90.degree. resulted in the addn. of 2-carboxyethyl or 3-carboxypropyl groups, resp., to the sidewalls of the SWNT. These acid-functionalized SWNTs were

converted to acid chlorides by derivatization with SOCl2 and then to amides with terminal diamines such as ethylenediamine, 4,4'-methylenebis(cyclohexylamine), and diethyltoluenediamine. The acid-functionalized SWNTs and the amide derivs. were characterized by a set of materials characterization methods including attenuated total reflectance (ATR) FTIR, Raman and solid state 13C NMR spectroscopy, TEM, and thermal gravimetry-mass spectrometry (TG-MS). The degree of SWNT sidewall functionalization with the acid-terminated groups was estd. as 1 in 24 carbons from TG-MS data. In comparison with the pristine SWNTs, the acid-functionalized SWNTs show an improved soly. in polar solvents, for example, alcs. and water, which enables their processing for incorporation into polymer composite structures as well as for a variety of biomedical applications.

IT **7440-44-0DP, Carbon,** sidewall functionalized (**nanotubes;** prepn. and improved soly. of sidewall carboxylic acid functionalized single-walled **carbon nanotubes** and conversion to amides via acid chloride intermediates)

RN 7440-44-0 HCA

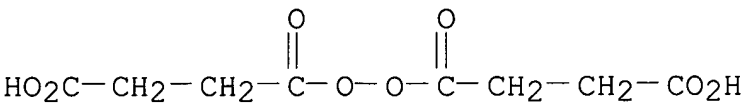
CN Carbon (7CI, 8CI, 9CI) (CA INDEX NAME)

C

IT **123-23-9P 10195-54-7P** (prepn. and reactant for prepn. of sidewall carboxylic acid functionalized single-walled **carbon nanotubes**)

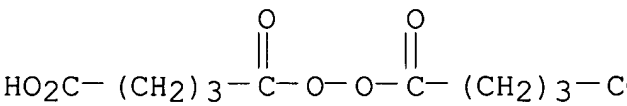
RN 123-23-9 HCA

CN Butanoic acid, 4,4'-dioxybis[4-oxo- (9CI) (CA INDEX NAME)



RN 10195-54-7 HCA

CN Pentanoic acid, 5,5'-dioxybis[5-oxo- (9CI) (CA INDEX NAME)



CC 78-1 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 22, 66

ST **carbon nanotube** carboxyethyl carboxypropyl

functionalized prepn soly; amide functionalized **carbon nanotube** prepn

IT **Nanotubes**
(**carbon**; prepn. and improved soly. of sidewall carboxylic acid functionalized single-walled **carbon nanotubes** and conversion to amides via acid chloride intermediates)

IT Solubility
(prepn. and improved soly. of sidewall carboxylic acid functionalized single-walled **carbon nanotubes** and conversion to amides via acid chloride intermediates)

IT Carboxyl group
(surface; prepn. and improved soly. of sidewall carboxylic acid functionalized single-walled **carbon nanotubes** and conversion to amides via acid chloride intermediates)

IT **7440-44-0DP, Carbon,** sidewall functionalized
(**nanotubes**; prepn. and improved soly. of sidewall carboxylic acid functionalized single-walled **carbon nanotubes** and conversion to amides via acid chloride intermediates)

IT 107-15-3DP, Ethylenediamine, reaction products with carboxyalkylated **carbon nanotubes** 1761-71-3DP, 4,4'-Methylenebis(cyclohexylamine), reaction products with carboxyalkylated **carbon nanotubes** 2095-02-5DP, 2,4-Diethyl-6-methyl-1,3-benzenediamine, reaction products with carboxyalkylated **carbon nanotubes**
(prepn. and improved soly. of sidewall carboxylic acid functionalized single-walled **carbon nanotubes** and conversion to amides via acid chloride intermediates)

IT **123-23-9P 10195-54-7P**
(prepn. and reactant for prepn. of sidewall carboxylic acid functionalized single-walled **carbon nanotubes**
)

IT 108-55-4, Glutaric anhydride
(reactant for prepn. of glutaric acid **acyl peroxide** for functionalization of **carbon nanotube** sidewalls)

IT 108-30-5, Succinic anhydride, reactions
(reactant for prepn. of succinic acid **acyl peroxide** for functionalization of **carbon nanotube** sidewalls)

L24 ANSWER 13 OF 15 HCA COPYRIGHT 2006 ACS on STN
140:59233 Addition of Carbon Radicals Generated from Organic Peroxides to Single Wall **Carbon Nanotubes**. Umek, Polona; Seo, Jin Won; Hernadi, Klara; Mrzel, Ales; Pechy, Peter; Mihailovic, Dragan D.; Forro, Laszlo (Institute of Physics of Complex Matter, Faculty of Basic Sciences, Swiss Federal Institute of Technology,

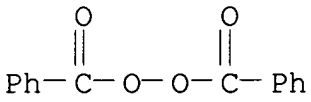
Lausanne, CH-1015, Switz.). Chemistry of Materials, 15(25), 4751-4755 (English) 2003. CODEN: CMATEX. ISSN: 0897-4756. Publisher: American Chemical Society.

AB Single wall **carbon nanotubes** (SWNT) were functionalized via addn. of carbon radicals, which were generated by thermal decompn. of **diacyl** and dibenzoyl **peroxides**. Reaction products were investigated with TEM, Raman scattering, TGA, UV-Visible spectroscopy, FTIR, and 1H NMR. In Raman spectra of functionalized SWNT materials one of the radial breathing modes with a max. at 260 cm-1 diminished completely. At the same time, the intensity ratio between the G- and D-bands decreased in comparison to that in the spectrum of raw SWNT material. From TGA measurements we conclude that SWNTs were derivatized up to 2.9-6.1 wt. % with functionalizing moieties. The loss of van Hove singularities in UV-Visible spectra of functionalized SWNTs also indicates a covalent modification of SWNTs.

IT **94-36-0DP**, Benzoyl peroxide, reaction products with single wall **carbon nanotubes** **105-74-8DP**, Lauroyl peroxide, reaction products with single wall **carbon nanotubes**
(addn. of **carbon** radicals generated from org. peroxides to single wall **carbon nanotubes**)

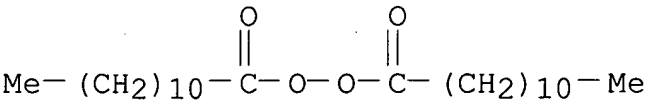
RN 94-36-0 HCA

CN Peroxide, dibenzoyl (9CI) (CA INDEX NAME)



RN 105-74-8 HCA

CN Peroxide, bis(1-oxododecyl) (9CI) (CA INDEX NAME)



IT **7440-44-0DP**, Carbon, reaction products with peroxide-derived radicals
(**nanotubes**, single wall; addn. of carbon radicals generated from org. peroxides to single wall **carbon nanotubes**)

RN 7440-44-0 HCA

CN Carbon (7CI, 8CI, 9CI) (CA INDEX NAME)

C

CC 22-4 (Physical Organic Chemistry)
Section cross-reference(s): 78
ST carbon radical addn single wall **carbon nanotube** peroxide thermolysis
IT Peroxides, reactions
(addn. of carbon radicals generated from org. peroxides to single wall **carbon nanotubes**)
IT **Nanotubes**
(**carbon**, single wall; addn. of carbon radicals generated from org. peroxides to single wall **carbon nanotubes**)
IT Addition reaction
(homolytic; addn. of carbon radicals generated from org. peroxides to single wall **carbon nanotubes**)
IT IR spectra
Raman spectra
Thermogravimetric analysis
Transmission electron microscopy
UV and visible spectra
(of radical addn. products; addn. of carbon radicals generated from org. peroxides to single wall **carbon nanotubes**)
IT NMR (nuclear magnetic resonance)
(proton, of radical addn. products; addn. of carbon radicals generated from org. peroxides to single wall **carbon nanotubes**)
IT **94-36-0DP**, Benzoyl peroxide, reaction products with single wall **carbon nanotubes** **105-74-8DP**, Lauroyl peroxide, reaction products with single wall **carbon nanotubes**
(addn. of **carbon** radicals generated from org. peroxides to single wall **carbon nanotubes**)
IT **7440-44-0DP**, Carbon, reaction products with peroxide-derived radicals
(**nanotubes**, single wall; addn. of carbon radicals generated from org. peroxides to single wall **carbon nanotubes**)

L24 ANSWER 14 OF 15 HCA COPYRIGHT 2006 ACS on STN
139:120005 Metal/active oxygen batteries with high energy density. Narang, Subhash; Ventura, Susanna; Sharma, Sunity (Sri International, USA). PCT Int. Appl. WO 2003063272 A1 20030731, 24 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR,

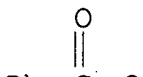
TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2003-US1371 20030116. PRIORITY: US 2002-2002/PV35012U 20020118; US 2002-2002/264931 20021004.

AB A battery includes an anode comprising a metal, a cathode comprising an active oxygen species, and a nonaq. electrolyte, wherein oxidn. of the metal and redn. of the active oxygen species provides the current of the battery.

IT **644-31-5**, Acetyl benzoyl peroxide
(metal/active oxygen batteries with high energy d.)

RN 644-31-5 HCA

CN Peroxide, acetyl benzoyl (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)



IT **7440-44-0**, **Carbon**, uses
(**nanotubes**; metal/active oxygen batteries with high energy d.)

RN 7440-44-0 HCA

CN Carbon (7CI, 8CI, 9CI) (CA INDEX NAME)

C

IC ICM H01M004-36
ICS H01M004-58

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

IT **Nanotubes**
(**carbon**; metal/active oxygen batteries with high energy d.)

IT 78-40-0, Triethyl phosphate 96-49-1, Ethylene carbonate 616-38-6, Dimethyl carbonate **644-31-5**, Acetyl benzoyl peroxide 686-31-7, tert-Amyl peroxy-2-ethylhexanoate 690-83-5, tert-Amyl peroxyacetate 3179-56-4, Acetyl cyclohexanesulfonyl peroxide 3425-61-4, tert-Amyl hydroperoxide 4511-39-1, tert-Amyl peroxybenzoate 7429-90-5, Aluminum, uses 7439-93-2, Lithium, uses 7439-95-4, Magnesium, uses 7440-23-5, Sodium, uses 7440-46-2, Cesium, uses 21324-40-3, Lithium hexafluorophosphate 37187-22-7, Acetylacetone peroxide 70833-40-8, tert-Amyl peroxy-2-ethylhexyl carbonate
(metal/active oxygen batteries with high energy d.)

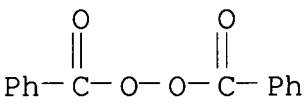
IT **7440-44-0**, **Carbon**, uses
(**nanotubes**; metal/active oxygen batteries with high energy d.)

L24 ANSWER 15 OF 15 HCA COPYRIGHT 2006 ACS on STN
138:342320 Sidewall functionalization of single-walled **carbon nanotubes** with organic peroxides. Peng, Haiqing; Reverdy, Paul; Khabashesku, Valery N.; Margrave, John L. (Department of Chemistry, Rice Quantum Institute and Center for Nanoscale Science and Technology, Rice University, Houston, TX, 77005-1892, USA). Chemical Communications (Cambridge, United Kingdom) (3), 362-363 (English) 2003. CODEN: CHCOFS. ISSN: 1359-7345. Publisher: Royal Society of Chemistry.

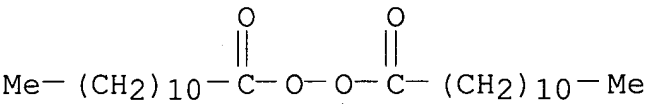
AB Single-wall **carbon nanotubes** (SWNTs) and their fluorinated derivs. (F-SWNTs) were reacted with org. peroxides including benzoyl and lauroyl peroxide to produce Ph and undecyl sidewall functionalized SWNTs, resp., which were characterized by Raman, FTIR, and UV-Vis-NIR spectra as well as TGA/MS, TGA/FTIR, and TEM data.

IT **94-36-0**, Benzoyl peroxide, uses **105-74-8**, Lauroyl peroxide
(functionalization agent; sidewall functionalization of single-walled **carbon nanotubes** with org. peroxides)

RN 94-36-0 HCA
CN Peroxide, dibenzoyl (9CI) (CA INDEX NAME)



RN 105-74-8 HCA
CN Peroxide, bis(1-oxododecyl) (9CI) (CA INDEX NAME)



IT **7440-44-0**, **Carbon**, processes **7440-44-0D**, **Carbon**, fluorinated derivs.
(**nanotubes**, functionalized; sidewall functionalization of single-walled **carbon nanotubes** with org. peroxides)

RN 7440-44-0 HCA
CN Carbon (7CI, 8CI, 9CI) (CA INDEX NAME)

C

RN 7440-44-0 HCA
CN Carbon (7CI, 8CI, 9CI) (CA INDEX NAME)

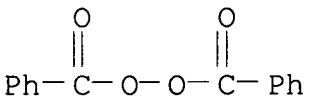
C

CC 57-8 (Ceramics)
Section cross-reference(s): 66, 78
ST **carbon nanotube** org peroxide sidewall functionalization; Ph sidewall functionalization **carbon nanotube**; undecyl sidewall functionalization **carbon nanotube**
IT **Nanotubes**
(**carbon**, functionalized; sidewall functionalization of single-walled **carbon nanotubes** with org. peroxides)
IT Phenyl group
(sidewall functionalization of single-walled **carbon nanotubes** with org. peroxides)
IT Functional groups
(undecyl; sidewall functionalization of single-walled **carbon nanotubes** with org. peroxides)
IT **94-36-0**, Benzoyl peroxide, uses **105-74-8**, Lauroyl peroxide
(functionalization agent; sidewall functionalization of single-walled **carbon nanotubes** with org. peroxides)
IT **7440-44-0**, **Carbon**, processes **7440-44-0D**, **Carbon**, fluorinated derivs.
(**nanotubes**, functionalized; sidewall functionalization of single-walled **carbon nanotubes** with org. peroxides)

=> d l25 1-7 cbib abs hitstr hitind

L25 ANSWER 1 OF 7 HCA COPYRIGHT 2006 ACS on STN
142:318432 Fireproof coating and its preparation. Cao, Daqing (Peop. Rep. China). Faming Zhuanli Shenqing Gongkai Shuomingshu CN 1483779 A 20040324, 5 pp. (Chinese). CODEN: CNXXEV. APPLICATION: CN 2003-126275 20030731.
AB The fireproofing coating is composed of Me (Ph, and/or vinyl) type silicone rubber 20-40, peroxide type crosslinking agent 3-6, **C** black **nanopowder** reinforcing agent 13-25, and inorg. filler 40-60 part. The inorg. filler is talc, heavy CaCO3, wollastonite, etc.
IT **94-36-0**, Benzoyl peroxide, uses
(formulations and prepn. of fireproofing coatings)

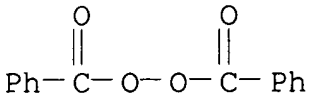
RN 94-36-0 HCA
CN Peroxide, dibenzoyl (9CI) (CA INDEX NAME)



IC ICM C09D183-00
ICS C09D005-18
CC 42-10 (Coatings, Inks, and Related Products)
IT **94-36-0**, Benzoyl peroxide, uses
(formulations and prepn. of fireproofing coatings)

L25 ANSWER 2 OF 7 HCA COPYRIGHT 2006 ACS on STN
142:116917 Synthesis of highly ordered uniform **nanoporous carbon** molecular sieve using liquid carbon precursor. Lee, Seung Jae; Yoon, Seok Bon; Yu, Jong Sung (S. Korea). Repub. Korean Kongkae Taeho Kongbo KR 2002025354 A 20020404, No pp. given (Korean). CODEN: KRXXA7. APPLICATION: KR 2000-57082 20000928.
AB Provided is a synthetic method of highly ordered uniform **nanoporous carbon** mol. sieve using a liq. carbon precursor. **Nanoporous carbon** mol. sieves are prepd. having a uniform pore size and they can be used as catalysts or sorbents. The synthetic method includes (i) making a silica colloidal crystal template using spherical silica having a particle size of 10 nm to 5 .mu.m; (ii) injecting liq. carbon precursors, such as aq. carbohydrate solns. or polymeric monomers into the silica colloidal crystal template; (iii) performing carbonization reaction under an inert atm. at 800-900.degree. to prep. a carbon-template complex; and (iv) immersing the carbon-template complex into an aq. HF soln. to selectively remove the silica colloidal crystal template. The liq. carbon precursor can be a carbohydrate, such as sucrose, glucose, xylose, or sugar or polymeric monomers, such as divinylbenzene, vinyl chloride, vinyl acetate, styrene, methacrylate, Me methacrylate, ethylene glycol, dimethacrylate, and CH2=CRR'. In the case of carbohydrates as a precursor the aq. carbohydrate is added with sulfuric acid in a mole ratio of 2 to 2.5, resp. before carbonization reaction. The polymeric monomer however, is injected into the silica colloidal crystal template being mixed with a radical initiator, such as azobisisobutyronitrile, benzoperoxide, or lauryl peroxide. Then, the polymeric monomer is polymd. at 60-75.degree..
IT **94-36-0**, Benzoperoxide, processes
(polymn. initiator; synthesis of highly ordered uniform **nanoporous carbon** mol. sieve using liq. carbon precursor)
RN 94-36-0 HCA

CN Peroxide, dibenzoyl (9CI) (CA INDEX NAME)



IT **7440-44-0P**, Carbon, preparation
(synthesis of highly ordered uniform **nanoporous carbon** mol. sieve using liq. carbon precursor)
RN 7440-44-0 HCA
CN Carbon (7CI, 8CI, 9CI) (CA INDEX NAME)

C

IC ICM C01B039-00
CC 49-1 (Industrial Inorganic Chemicals)
Section cross-reference(s): 38, 44, 48, 67
ST **nanoporous carbon** mol sieve silica template carbohydrate monomer precursor
IT Molecular sieves
(carbon; synthesis of highly ordered uniform **nanoporous carbon** mol. sieve using liq. carbon precursor)
IT Carbonization
Polymerization
(synthesis of highly ordered uniform **nanoporous carbon** mol. sieve using liq. carbon precursor)
IT Alkenes, reactions
Carbohydrates, reactions
(synthesis of highly ordered uniform **nanoporous carbon** mol. sieve using liq. carbon precursor)
IT 7631-86-9, Silica, processes
(colloidal, template; synthesis of highly ordered uniform **nanoporous carbon** mol. sieve using liq. carbon precursor)
IT 78-67-1, Azobisisobutyronitrile **94-36-0**, Benzoperoxide, processes 2895-03-6, Lauryl peroxide
(polymn. initiator; synthesis of highly ordered uniform **nanoporous carbon** mol. sieve using liq. carbon precursor)
IT **7440-44-0P**, Carbon, preparation
(synthesis of highly ordered uniform **nanoporous carbon** mol. sieve using liq. carbon precursor)
IT 7664-39-3, Hydrofluoric acid, processes 7664-93-9, Sulfuric acid, processes
(synthesis of highly ordered uniform **nanoporous carbon** mol. sieve using liq. carbon precursor)

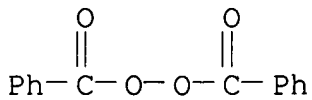
IT 50-99-7, D-Glucose, reactions 57-50-1, Sucrose, reactions 58-86-6, Xylose, reactions 75-01-4, Vinyl chloride, reactions 80-62-6, Methacrylic acid methyl ester 100-42-5, Styrene, reactions 107-21-1, Ethylene glycol, reactions 108-05-4, Vinyl acetate, reactions 1321-74-0, Divinylbenzene, reactions 18358-13-9, Methacrylate, reactions 50867-57-7, Dimethacrylic acid
(synthesis of highly ordered uniform **nanoporous carbon** mol. sieve using liq. carbon precursor)

L25 ANSWER 3 OF 7 HCA COPYRIGHT 2006 ACS on STN
140:359743 Preparation of **nanoporous carbons** with enhanced mechanical strength. Yu, Jong Sung; Lee, Jin Gyu; Chang, Seok (S. Korea). U.S. Pat. Appl. Publ. US 2004091415 A1 20040513, 15 pp. (English). CODEN: USXXCO. APPLICATION: US 2002-325884 20021223. PRIORITY: KR 2002-70304 20021113.

AB **Nanoporous carbons** with enhanced mech. strength are prepd. by (i) synthesizing a mesoporous silica template not being subjected to any calcination process; (ii) incorporating a mixt. of a monomer for addn. polymn. and initiator, or a mixt. of a monomer for condensation polymn. and acid catalyst into the as-synthesized mesoporous silica template, and reacting the mixt. to obtain a polymer-silica composite; and (iii) carbonizing the polymer-silica composite at 900-1000.degree. to obtain a carbon-silica composite, from which the silica template is then removed using a solvent. The monomer for addn. polymn. of step (ii) can be divinylbenzene, acrylonitrile, vinyl chloride, vinyl acetate, styrene, methacrylate, methylmethacrylate, ethylene glycol, dimethacrylate, CH2=CRR' where R and R' represent alkyl groups or aryl groups and the initiator can be AIBN, t-Bu peracetate, benzoyl peroxide, acetyl peroxide, or lauryl peroxide. The monomer for condensation polymn. of step (ii) can be phenol-formaldehyde, phenol, furfural alc., resorcinol, sucrose, glucose, or xylose and the acid catalyst can be HCl and/or H2SO4. Therefore, the **nanoporous carbons** of the present invention can be used as catalysts, catalyst supports, sepg. agents, hydrogen reserving materials, adsorbents, membranes and membrane fillers in various application fields.

IT **94-36-0**, Benzoyl peroxide, processes **110-22-5**, Acetyl peroxide
(initiator; prepn. of **nanoporous carbons** with enhanced mech. strength)

RN 94-36-0 HCA
CN Peroxide, dibenzoyl (9CI) (CA INDEX NAME)



RN 110-22-5 HCA
CN Peroxide, diacetyl (9CI) (CA INDEX NAME)

Ac—O—O—Ac

IT **7440-44-0P, Carbon,** preparation
(prepn. of **nanoporous carbons** with enhanced mech. strength)
RN 7440-44-0 HCA
CN Carbon (7CI, 8CI, 9CI) (CA INDEX NAME)

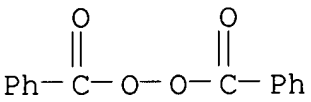
C

IC ICM C01B031-02
INCL 423445000R
CC 49-1 (Industrial Inorganic Chemicals)
Section cross-reference(s): 57
ST **nanoporous carbon** prepn zeolite template polymn calcination
IT MCM zeolites
(MCM-48; prepn. of **nanoporous carbons** with enhanced mech. strength)
IT High-silica zeolites
(SBA-15; prepn. of **nanoporous carbons** with enhanced mech. strength)
IT 7631-86-9, Silica, reactions
(Ludox HS40; prepn. of **nanoporous carbons** with enhanced mech. strength)
IT 78-67-1, AIBN **94-36-0**, Benzoyl peroxide, processes
107-71-1, tert-Butyl peracetate **110-22-5**, Acetyl peroxide
2895-03-6, Lauryl peroxide
(initiator; prepn. of **nanoporous carbons** with enhanced mech. strength)
IT 50-00-0, Formaldehyde, reactions 50-99-7, D-Glucose, reactions
57-50-1, Sucrose, reactions 58-86-6, Xylose, reactions 75-01-4, Vinyl chloride, reactions 80-62-6, Methylmethacrylate 98-00-0, 2-Furanmethanol 100-42-5, Styrene, reactions 107-13-1, Acrylonitrile, reactions 107-21-1, Ethylene glycol, reactions
108-05-4, Vinyl acetate, reactions 108-46-3, Resorcinol, reactions
108-95-2, Phenol, reactions 1321-74-0, Divinylbenzene, reactions
18358-13-9, Methacrylate, reactions 50867-57-7, 2-Propenoic acid, 2-methyl-, dimer
(polymn.; prepn. of **nanoporous carbons** with enhanced mech. strength)
IT 7647-01-0, Hydrochloric acid, uses 7664-93-9, Sulfuric acid, uses

(prepn. of **nanoporous carbons** with enhanced mech. strength)
IT 7664-39-3, Hydrofluoric acid, processes
(prepn. of **nanoporous carbons** with enhanced mech. strength)
IT **7440-44-0P, Carbon**, preparation
(prepn. of **nanoporous carbons** with enhanced mech. strength)
IT 78-10-4, TEOS 1313-59-3, Sodium oxide, reactions
(prepn. of **nanoporous carbons** with enhanced mech. strength)
IT 9003-69-4P, Divinylbenzene homopolymer
(prepn. of **nanoporous carbons** with enhanced mech. strength)
IT 106392-12-5, Ethylene oxide-propylene oxide block copolymer
(structure directing agent; prepn. of **nanoporous carbons** with enhanced mech. strength)
IT 57-09-0, Hexadecyltrimethylammonium bromide 9002-92-0, Polyoxyethylene laurylether
(surfactant; prepn. of **nanoporous carbons** with enhanced mech. strength)

L25 ANSWER 4 OF 7 HCA COPYRIGHT 2006 ACS on STN
139:157300 Laser-induced direct lithography for patterning of carbon with sp3 and sp2 hybridization. Zbaida, David; Popovitz-Biro, Ronit; Lachish-Zalait, Aurelie; Klein, Eugenia; Wachtel, Ellen; Prior, Yehiam; Elbaum, Michael (Dept. of Materials and Interfaces, The Weizmann Institute of Science, Rehovot, 76100, Israel). Advanced Functional Materials, 13(5), 412-417 (English) 2003. CODEN: AFMDC6. ISSN: 1616-301X. Publisher: Wiley-VCH Verlag GmbH & Co. KGaA.
AB A new method of laser-induced lithog. for direct writing of carbon on a glass surface is described, in which deposition occurs from a transparent precursor soln. At the glass-soln. interface where the laser spot is focused, a micro-explosion process takes place, leading to the deposition of pure carbon on the glass surface. Transmission electron microscopy (TEM) anal. shows two distinct co-existing phases. The dominant one shows a mottled morphol. with diffraction typical of cubic (sp3) diamond. The other region shows an ordered array of graphene sheets with diffraction pattern typical of sp2-bonded carbon. The sp3 crystallites range in size from 9 to 30 .ANG. and are scattered randomly throughout the sample. A UV Raman spectrum shows a broad band at the location of the expected diamond peak, together with a peak corresponding to the **graphite** region. We conclude that the patterned carbon is composed of a mixt. of **nanocryst**. sp3 and sp2 **carbon** forms.
IT **94-36-0**, Dibenzoyl peroxide, reactions

(carbon precursor; laser-induced direct lithog. for patterning of carbon with sp3 and sp2 hybridization)
RN 94-36-0 HCA
CN Peroxide, dibenzoyl (9CI) (CA INDEX NAME)



IT **7440-44-0P**, Carbon, properties **7782-42-5P**, **Graphite**, properties
(laser-induced direct lithog. for patterning of carbon with sp3 and sp2 hybridization)
RN 7440-44-0 HCA
CN Carbon (7CI, 8CI, 9CI) (CA INDEX NAME)

C

RN 7782-42-5 HCA
CN Graphite (8CI, 9CI) (CA INDEX NAME)

C

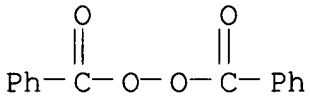
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other Reprographic Processes)
IT **94-36-0**, Dibenzoyl peroxide, reactions
(carbon precursor; laser-induced direct lithog. for patterning of carbon with sp3 and sp2 hybridization)
IT **7440-44-0P**, Carbon, properties **7782-42-5P**, **Graphite**, properties
(laser-induced direct lithog. for patterning of carbon with sp3 and sp2 hybridization)

L25 ANSWER 5 OF 7 HCA COPYRIGHT 2006 ACS on STN
137:355390 Microporous polymer separator for secondary lithium battery and its preparation method. Gu, Hui; Huang, Xuejie; Chen, Liquan; Ren, Xumei; Wu, Feng; Shan, Zhongjiang (Inst. of Physics, Chinese Academy of Sciences, Peop. Rep. China). Faming Zhuanli Shenqing Gongkai Shuomingshu CN 1322019 A 20011114, 21 pp. (Chinese). CODEN: CNXXEV. APPLICATION: CN 2000-107243 20000429.
AB The materials for prepn. of microporous polymer separator for secondary lithium battery include thermosetting polymer (20-80%), inducing agent (0.1-5.0%), crosslinking agent such as epoxy resin crosslinking agent or unsatd. polyester crosslinking agent, promotor, thermoplastic polymer having a m.p. 60-140.degree.

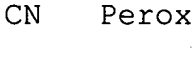
C, nanometer oxides, solvents, etc. The thermosetting polymer is selected from epoxy resins, unsatd. polyesters, phenol-formaldehyde copolymers, and polyimides. The inducing agent is selected from tert-Bu hydrogen peroxide, isopropylbenzyl hydroperoxide, di(tert-butyl) peroxide, acetyl hydroperoxide, persadox, acetyl peroxide, tert-Bu performate, Me Et ketone peroxide, cyclohexanone peroxide, etc. The epoxy resin crosslinking agent is selected from diethylaminopropylamine, amino-resin, amino-glyceryl ether, amino-epoxyethane addn. products, trimethylamine and its derivs., phthalic anhydride, maleic anhydride, hexahydrophthalic anhydride, 1,2,4,5-benzene tetracarboxylic anhydride, 2-ethyl-4-Me imidazole, etc. The unsatd. polyester crosslinking agent is selected from styrene, Me methacrylate, diallyl phthalate, Me styrene, and triallyl cyanurate. The promotor is selected from bisphenol A, phenol, 1,3- benzenediol, nonyl phenol, 2,4,6-tri(dimethylaminomethyl)phenol, mercapto acetic acid, tri-Ph phosphinic acid esters, boron trifluoride ethylamine, benzyl dimethylamine, N,N-di-Me aniline, pyridine, 2-ethyl-4-Me imidazole, triethanolamine borate, etc. The unsatd. polyester promotor is selected from cyclohexane carboxylic acid cobalt salt, Zn octanoate, N,N-di-Me aniline, N,N-di-Et aniline, N,N-dimethyl-4-Me aniline, 2,4-pentanedione, etc. The thermoplastic polymer is selected from PVDF, poly(..epsilon..-caprolactone) (PCL), poly(1-butene), poly(1-pentene), polystyrene, polyformaldehyde, EVA, PBMA, SBS, polyallyl methacrylate, acetyl cellulose, poly(1,3-butadiene), poly(di-Pr oxalate), poly(ethylene succinate), nylon 610, poly(di-Me allyl), poly(valeraldehyde), etc. The separator is prepd. by applying a soln. of the components to a substrate (glass, plastics, metal), evapg. to the disappearance of viscosity, and then drying in vacuum at a temp. below the softening point of the thermoplastic polymer for 12-24 h.

IT **94-36-0**, Peroxide, dibenzoyl, uses **110-22-5**, Acetyl peroxide
(microporous polymer separator for secondary lithium battery and its prepn. method)

RN 94-36-0 HCA
CN Peroxide, dibenzoyl (9CI) (CA INDEX NAME)



RN 110-22-5 HCA
CN Peroxide, diacetyl (9CI) (CA INDEX NAME)

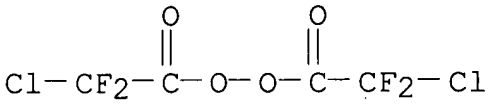


IC ICM H01M002-16
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 35
IT 68-11-1, Mercapto acetic acid, uses 75-23-0, Boron trifluoride ethylamine 75-50-3, Trimethylamine, uses 75-91-2, tert-Butyl hydrogen peroxide 79-21-0, Acetyl hydroperoxide 80-05-7, Bisphenol A, uses 80-62-6, Methyl methacrylate 85-42-7, Hexahydrophthalic anhydride 85-44-9, Phthalic anhydride 89-32-7 90-72-2 91-66-7, N,N-Diethyl aniline **94-36-0**, Peroxide, dibenzoyl, uses 99-97-8, N,N-Dimethyl-4-methyl aniline 100-42-5, Styrene, uses 101-37-1, Triallyl cyanurate 103-83-3, Benzyl dimethylamine 104-78-9 108-31-6, Maleic anhydride, uses 108-46-3, 1,3-Benzenediol, uses 108-95-2, Phenol, uses 110-05-4, Di(tert-butyl) peroxide **110-22-5**, Acetyl peroxide 110-86-1, Pyridine, uses 121-69-7, N,N-Dimethyl aniline, uses 123-54-6, 2,4-Pentanedione, uses 131-17-9, Diallyl phthalate 283-56-7, Triethanolamine borate 504-66-5, Dicyanimide 557-09-5, Zinc octanoate 819-50-1 931-36-2, 2-Ethyl 4-methyl imidazole 1338-23-4, Methyl ethyl ketone peroxide 1706-96-3, Phenyl diphenylphosphinate 7445-54-7, Cyclohexane carboxylic acid cobalt salt 12262-58-7, Cyclohexanone peroxide 25013-15-4, Benzene, ethenylmethyl- 25154-52-3, Nonyl phenol 82231-60-5, Isopropyl benzyl hydroperoxide
(microporous polymer separator for secondary lithium battery and its prepn. method)

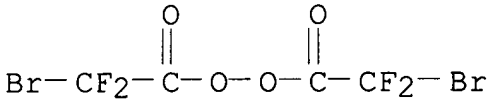
L25 ANSWER 6 OF 7 HCA COPYRIGHT 2006 ACS on STN
130:15663 Nanoscale solid superacid catalysts with pendant fluoroalkylsulfonic acid or fluoro, perfluoroalkylsulfonic acid groups. Olah, George A.; Prakash, G. K. Surya (USA). PCT Int. Appl. WO 9850152 A1 19981112, 16 pp. DESIGNATED STATES: W: AL, AM, AU, AZ, BA, BB, BG, BR, BY, CA, CN, CU, CZ, EE, GE, GH, GW, HU, ID, IL, IS, JP, KG, KP, KR, KZ, LC, LK, LR, LT, LV, MD, MG, MK, MN, MX, NO, NZ, PL, RO, RU, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UZ, VN, YU, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (English). CODEN: PIXXD2. APPLICATION: WO 1998-US9263 19980506. PRIORITY: US 1997-46338 19970507.
AB A solid superacid catalyst compn. of a carrier material having a particle size of between 0.5 and 5000 nm and at least one pendant fluoroalkylsulfonic acid or fluoro, perfluoroalkylsulfonic acid group attached thereto. Also, methods for making this catalysts by attaching pendant fluoroalkylsulfonic acid or fluoro, perfluoroalkylsulfonic acid groups to the carrier material by various procedures to form the catalyst compn.
IT **360-42-9 116071-08-0**

(nanoscale solid superacid catalysts with pendant fluoroalkylsulfonic acid or fluoro, perfluoroalkylsulfonic acid groups)

RN 360-42-9 HCA
CN Peroxide, bis(chlorodifluoroacetyl) (8CI, 9CI) (CA INDEX NAME)



RN 116071-08-0 HCA
CN Peroxide, bis(bromodifluoroacetyl) (9CI) (CA INDEX NAME)



IC ICM B01J031-00
ICS B01J031-06; B01J031-18; B01J031-22
CC 51-4 (Fossil Fuels, Derivatives, and Related Products)
Section cross-reference(s): 67
IT 75-05-8, Acetonitrile, reactions 75-61-6, **Carbon** bromide fluoride (CBr2F2) 121-44-8, reactions 144-55-8, Sodium carbonate (NaHCO3), reactions **360-42-9** 7664-93-9, Sulfuric acid, reactions 7722-84-1, Hydrogen peroxide (H2O2), reactions 7775-14-6, Sodium dithionite (Na2S2O4) 99685-96-8, Fullerene **116071-08-0** 216058-14-9
(**nanoscale** solid superacid catalysts with pendant fluoroalkylsulfonic acid or fluoro, perfluoroalkylsulfonic acid groups)

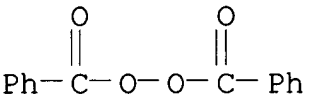
L25 ANSWER 7 OF 7 HCA COPYRIGHT 2006 ACS on STN
128:286810 Ultrathin self-assembled nanosilicon/siloxane composite films. Papadimitrakopoulos, F.; Phely-Bobin, T.; Wisniecki, P. (Department of Chemistry, Nanomaterials Optoelectronics Lab., Institute of Materials Science, Polymer Science Program, University of Connecticut, Storrs, CT, 06269-3136, USA). Polymer Preprints (American Chemical Society, Division of Polymer Chemistry), 39(1), 177-178 (English) 1998. CODEN: ACPPAY. ISSN: 0032-3934. Publisher: American Chemical Society, Division of Polymer Chemistry.
AB Our group has reported the prepn. of colloidal silicon from high energy milling with particle size from 20 to 40 nm and size distribution in the order of 25%. Formation of stable colloids is in part attributed to a thin surface oxide layer. Presently, we are reporting a sonication assisted oxidn. process which results in the formation of a metastable nanosilicon colloid. Immersing glass or

quartz substrates in this colloid leads to the formation of a highly transparent ultrathin Si film of an orange hue. A monolayer of **nanoparticles** (**c**.a. 20 nm) contribute to a majority of substrate coverage, although some agglomeration is also present (in the order 50-60 nm). Kinetic studies indicate a rapid initial adsorption that plateaus after 3 h. The ultrathin coverage achieved by this method enables these films to be used as light outcoupling layers as well as in numerous other applications in optoelectronics and semiconductor industry.

IT **94-36-0**, Benzoyl peroxide, uses
(ultrathin self-assembled nanosilicon/siloxane composite films)

RN 94-36-0 HCA

CN Peroxide, dibenzoyl (9CI) (CA INDEX NAME)



CC 66-4 (Surface Chemistry and Colloids)
Section cross-reference(s): 73

IT **94-36-0**, Benzoyl peroxide, uses
(ultrathin self-assembled nanosilicon/siloxane composite films)

=> d his l26-

FILE 'REGISTRY' ENTERED AT 14:14:06 ON 04 MAY 2006
L26 4909 S C/ELS AND 1/ELC.SUB

FILE 'HCA' ENTERED AT 14:18:22 ON 04 MAY 2006
L27 1353 S BUCKYTUB? OR (L26 OR FULLERENE#)(3A)(TUBE# OR TUBING# O
L28 12641 S (L26 OR FULLERENE#)(3A)(NANOTUBE# OR NANOTUBING# OR NAN
L29 32163 S (L26 OR FULLERENE# OR BUCKY?) AND NANO?
L30 404 S (L26 OR FULLERENE# OR BUCKY?) AND FIBRIL?
L31 23 S (L27 OR L28 OR L29 OR L30) AND (L12 OR L13)
L32 5 S L31 AND (L14 OR L15)
L33 7 S L31 AND IODIDE#
L34 1 S L33 NOT (L23 OR L24 OR L25)
L35 1 S L31 NOT (L23 OR L24 OR L25 OR L34)
L36 2 S L34 OR L35

=> d l36 1-2 cbib abs hitstr hitind

L36 ANSWER 1 OF 2 HCA COPYRIGHT 2006 ACS on STN
133:238399 Free radical ternary copolymerization of C60 with styrene and

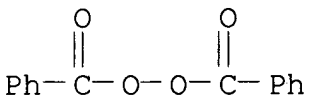
maleic anhydride. Guan, Wen-Chao; Lei, Hong; Liao, Dao-Xun (Department of Chemistry, Huazhong University of Science and Technology, Wuhan, 430074, Peop. Rep. China). Gaodeng Xuexiao Huaxue Xuebao, 21(7), 1149-1150 (Chinese) 2000. CODEN: KTHPDM. ISSN: 0251-0790. Publisher: Gaodeng Jiaoyu Chubanshe.

AB C60 **fullerene**-styrene-maleic anhydride copolymer was prepd. with radical polymn. of C60, styrene, and f maleic anhydride dissolved in o-dichlorobenzene in the presence of benzoyl peroxide catalyst at 70.degree. for 32 h. The copolymer was obtained as a brown solid. The structure of copolymer was characterized by UV and FTIR. GPC analyses showed that the wt.-av. mol. wt. was 13,000. The copolymer was sol. in THF, DMSO, and water. The surface tension of 0.5% of copolymer aq. soln. was 54.6 .times. 10-3 N/m (20.degree.C). TEM analyses showed that the copolymer is a kind of water-sol. **nanosphere** with the av. diam. of about 60 nm.

IT **94-36-0**, Benzoyl peroxide, uses
(catalysts; prepn. of C60 **fullerene**-maleic anhydride-styrene copolymer in presence of benzoyl peroxide catalyst)

RN 94-36-0 HCA

CN Peroxide, dibenzoyl (9CI) (CA INDEX NAME)



CC 35-4 (Chemistry of Synthetic High Polymers)

ST radical polymn **fullerene** styrene maleic anhydride; benzoyl peroxide polymn catalyst radical

IT Polymerization catalysts
(radical; prepn. of C60 **fullerene**-maleic anhydride-styrene copolymer in presence of benzoyl peroxide catalyst)

IT **94-36-0**, Benzoyl peroxide, uses
(catalysts; prepn. of C60 **fullerene**-maleic anhydride-styrene copolymer in presence of benzoyl peroxide catalyst)

IT 270082-34-3P
(prepn. of C60 **fullerene**-maleic anhydride-styrene copolymer in presence of benzoyl peroxide catalyst)

L36 ANSWER 2 OF 2 HCA COPYRIGHT 2006 ACS on STN

121:133327 Production of perfluoroalkylated **nanospheres** from buckminsterfullerene. Fagan, Paul J.; Krusic, Paul J.; McEwen, C. N.; Lazar, J.; Parker, Deborah Holmes; Herron, N.; Wasserman, E. (Cent. Res. Dev. Dep., E.I. du Pont de Nemours and Co., Wilmington, DE, 19880-0328, USA). Science (Washington, DC, United States),

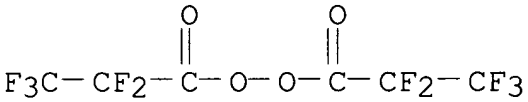
262(5132), 404-7 (English) 1993. CODEN: SCIEAS. ISSN: 0036-8075.

AB Perfluoroalkylated **nanospheres** have been prepd. by reaction of **fullerenes** with a variety of fluoroalkyl radicals. The latter are generated by thermal or photochem. decompn. of fluoroalkyl **iodides** or fluorodiacyl peroxides. Up to 16 radicals add to C60 to afford easily isolable fluoroalkylated derivs. The monosubstituted radical adducts were detected by ESR in the early stages of the fluoroalkylation reactions. These spheroidal mols. are thermally quite stable, sol. in fluoroorg. solvents, chem. resistant to corrosive aq. solns., and more volatile than the parent **fullerenes**. Films of the sublimed material display properties typical for a perfluoroalkylated material.

IT **356-45-6**, Perfluoropropionyl peroxide **99685-96-8**, C60 **Fullerene 115383-22-7**, C70 **Fullerene**
(thermal and photochem. perfluoroalkylation of C60 **fullerene** with perfluoroalkyl **iodides** or fluorodiacyl peroxides, ESR of reaction intermediates, and contact angles of sublimed films)

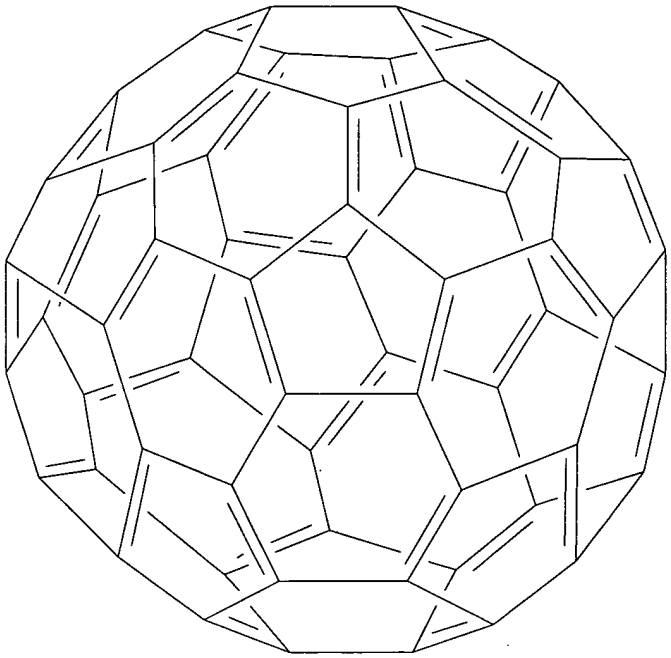
RN 356-45-6 HCA

CN Peroxide, bis(2,2,3,3,3-pentafluoro-1-oxopropyl) (9CI) (CA INDEX NAME)



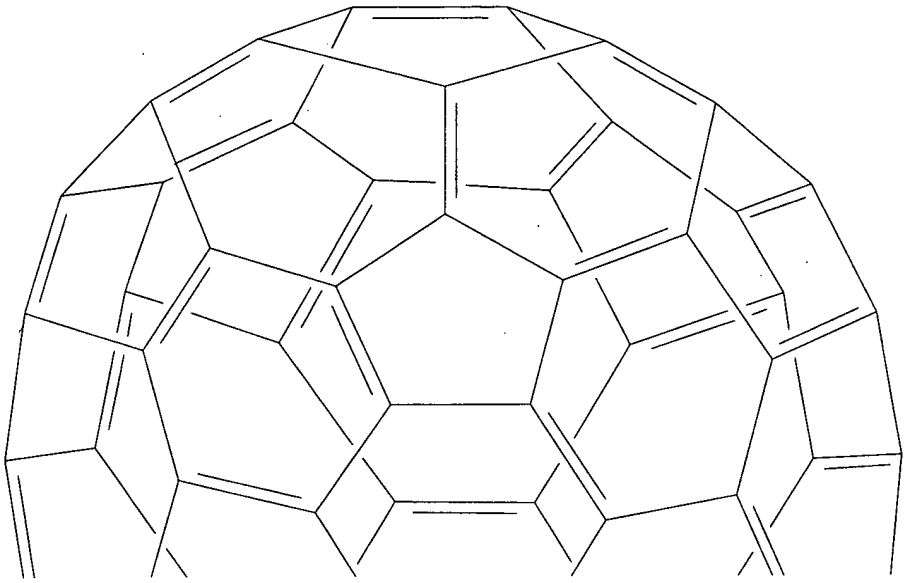
RN 99685-96-8 HCA

CN [5,6]Fullerene-C60-Ih (9CI) (CA INDEX NAME)

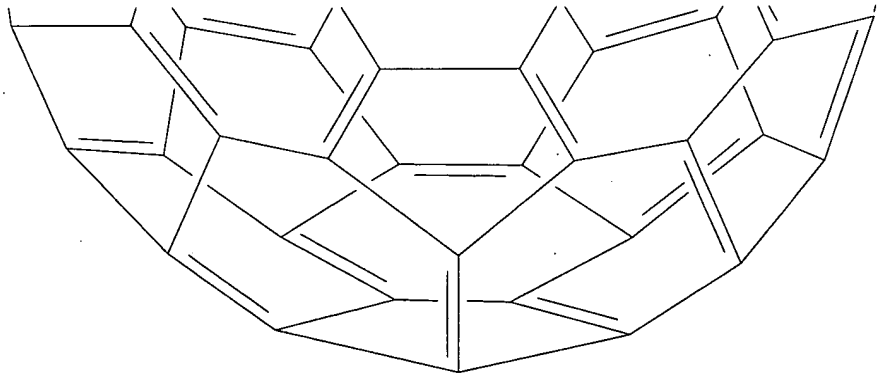


RN 115383-22-7 HCA
CN [5,6]Fullerene-C70-D5h(6) (9CI) (CA INDEX NAME)

PAGE 1-A



PAGE 2-A



CC 22-4 (Physical Organic Chemistry)
Section cross-reference(s): 25

ST radical perfluoroalkylation photochem thermal **fullerene;** film perfluoroalkylated **fullerene;** ESR perfluoroalkylation

fullerene
IT Conformation and Conformers
Electron spin resonance
Films
Hydrogen transfer
Sublimation
(thermal and photochem. perfluoroalkylation of C60 **fullerene** with perfluoroalkyl **iodides** or fluorodiacyl peroxides, ESR of reaction intermediates, and contact angles of sublimed films)
IT **Fullerenes**
(thermal and photochem. perfluoroalkylation of C60 **fullerene** with perfluoroalkyl **iodides** or fluorodiacyl peroxides, ESR of reaction intermediates, and contact angles of sublimed films)
IT Perfluoro compounds
(alkyl **iodides**, thermal and photochem. perfluoroalkylation of C60 **fullerene** with perfluoroalkyl **iodides** or fluorodiacyl peroxides, ESR of reaction intermediates, and contact angles of sublimed films)
IT Alkyl **iodides**
(perfluoro, thermal and photochem. perfluoroalkylation of C60 **fullerene** with perfluoroalkyl **iodides** or fluorodiacyl peroxides, ESR of reaction intermediates, and contact angles of sublimed films)
IT Haloalkylation
(perfluoroalkylation, thermal and photochem. perfluoroalkylation of C60 **fullerene** with perfluoroalkyl **iodides** or fluorodiacyl peroxides, ESR of reaction intermediates, and contact angles of sublimed films)
IT 155181-00-3 155944-49-3 157177-72-5
(prepn. as intermediate; thermal and photochem. perfluoroalkylation of C60 **fullerene** with perfluoroalkyl **iodides** or fluorodiacyl peroxides, ESR of reaction intermediates, and contact angles of sublimed films)
IT 355-43-1D, perfluoroalkylated and perfluoroalkylated, hydrogenated
(prepn.; thermal and photochem. perfluoroalkylation of C60 **fullerene** with perfluoroalkyl **iodides** or fluorodiacyl peroxides, ESR of reaction intermediates, and contact angles of sublimed films)
IT 354-64-3, Perfluoroethyl **iodide** 355-43-1, Perfluorohexyl **iodide** **356-45-6**, Perfluoropropionyl peroxide 544-76-3, Hexadecane 754-34-7, Perfluoropropyl **iodide** 2314-97-8, Trifluoromethyl **iodide** 7732-18-5, Water, properties **99685-96-8**, C60 **Fullerene** **115383-22-7**, C70 **Fullerene**
(thermal and photochem. perfluoroalkylation of C60 **fullerene** with perfluoroalkyl **iodides** or

fluorodiacyl peroxides, ESR of reaction intermediates, and contact angles of sublimed films)